



# CHEMICAL ABSTRACTS

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No. 18

## 1—APPARATUS

C. G. DERRICK

The use of commercial viscosimeters. H. GAULT AND I. BOISSELET. *Mat. grasses* 14, 6185(1922).—In a particular instance an Engler-type viscosimeter gave a viscosity at 50° for a machine oil 1° Engler lower than a standard instrument. This was traced to the fact that the capacity of the chamber in the first instrument was 8 cc. too great, causing an increase in head. This did not appreciably affect the rate of flow of water at the temp. of standardization, but increased that of the oil at 50°.

A. P.-C.

Organic liquids for use in thermometers. G. MOELLER. *Z. Instrumentenk.* 41, 152-6(1921); *Science Abstracts* 24A, 703.—A description is given of the results of expts. to det. the suitability of certain org. liquids for use as thermometric substances. The liquids were colored with 1% of asphalt. Of the liquids tested amyl benzoate had the most even expansion, though this substance, if 0° and 100° were taken as fixed points, indicated 47.9° and 212.7° at 50° and 200°, resp.

H. G.

Disappearing filament optical pyrometer free from diffraction effects at the filament. C. O. FAIRCHILD. *Phys. Rev.* 18, 116-8(1921); *Science Abstracts* 23A, 224.

H. G.

Refractometer for liquids. S. NAKAMURA AND A. MURAMOTO. *Proc. Phys. Math. Soc. Japan* 4, 3-7(1922); *Science Abstracts* 25A, 305.

Simple differential refractometer for liquids. J. S. ANDERSON. *Trans. Optical Soc.* 22, 3, 156-60(1920-1); *Science Abstracts* 25A, 306.

A new type of monochromatic light source. A. B. PECK. *Am. Mineral.* 7, 104-6(1922).—A thin piece of Pt sheet is riddled with needle holes, these are then filled with pptd.  $(\text{NH}_4)_2\text{PtCl}_6$ , and the whole is ignited, forming Pt sponge in the holes. A stiff wire is attached, and the sheet immersed in a salt of Na, Li, or other metal to be used. It gives an intense and long-lasting flame coloration. A collar mount for attaching it to a Meker burner is described and figured.

E. T. WHERRY

The duplex mono-chimney-gas apparatus (MOELLER) 21.

Gas-analyzing apparatus. O. RÖDRE. U. S. reissue 15,409, July 11. See original pat. 1,302,224, C. A. 13, 1781.

Gas-analyzing apparatus. W. D. R. BROWN AND W. T. PICKSTON. U. S. 1,422,080, July 11. The app. is adapted for automatic and continuous analysis of flue and other gases. It comprizes initial and residual gas-measuring chambers with connections such that withdrawal of the sealing liquid from the initial gas-measuring chamber by a vacuum serves to unseal the exit of the residual gas-measuring chamber.

Apparatus for purification of gases. YOSHIO MISAWA. *Japn.* 39,685, Aug. 23, 1921. The app. is made of 5 or more cylinders of glass. They have many shelves but no bottom and stand in  $\text{H}_2\text{O}$ . The middle cylinder is heated by an elec. coil to 350°.  $\text{O}_2$ ,  $\text{H}_2$ , or other gas passed in the app. is purified in the middle cylinder; the others are used as safety devices.

**Continuous centrifugal separator.** GIICHI ISHIKAWA. Japn. 39,669, Aug. 23, 1921. A conical cage is used as a revolving separator, the narrow part being the top. Solid sepd. from the liquid is continuously collected in the bottom.

**Centrifugal water separator.** HIROSHI KOHAMA. Japn. 39,671, Aug. 23, 1921. The gearing of the revolving axis and gear wheel is easily detached, so the latter is quickly stopped.

**Apparatus for drying liquids in the form of a spray in a circulating current of air.** C. FIELD. U. S. 1,423,928, July 15.

**Apparatus for cooling milk, worts or other liquids.** M. GRUBENMANN. U. S. 1,423,794, July 25. The liquid to be cooled is caused to flow downwardly over a vertical corrugated sheet of Al or other metal, which may be cooled by brine on its opposite side.

**Filters for carburetting and vaporizing.** E. R. SUTCLIFFE. Brit. 177,552, Sept. 22, 1920. A filter for the vapor from a vaporizer or the mixt from a carburettor is charged with an activated and liquid-absorbent carbonaceous substance prep'd. as claimed in 166,202 (C. A. 16, 336) or by subjecting carbonaceous substances to steam at 1000° and is heated. An enlarged casing is mounted upon the induction pipe and contains the filtering material between perforated or gauze plates and is heated by a coil. According to the provisional specification, prep'd. Fe ore may be used as the filtering means.

**Gas generator.** P. DORSEY. U. S. 1,422,938, July 18. The pat. relates to devices for controlling the supply of material such as  $\text{CaC}_2$  or other solid material to a gas generator under control of the pressure of gas in the generator.

**Pipe system for heat interchange.** P. SR. CLAIR, JR. U. S. 1,423,695, July 25. The app. is adapted for use with gases or liquids.

**Hydrometer with a celluloid outer shell.** J. O. LUTHY. U. S. 1,424,108, July 25.

**Apparatus for measuring liquids.** M. J. VERHULST. Brit. 178,108, Apr. 2, 1922. In a fixed-chamber app. in which there are at least two measuring chambers so adapted that liquid overflows from one into the other each chamber is provided with float-operated gear controlling the supply and delivery of the other chamber. The chambers are discharged by siphons, and the parts are so arranged that the liquid is allowed to come to rest before being discharged.

**Pyrometers, etc.** SOC. ANON. DE COMMENTRY, FOURCHAMBAULT, ET DECAZEVILLE. Brit. 177,149, Feb. 8, 1922. App. for the thermometric analysis of *metals and alloys* comprizes means for simultaneously recording the variations in temp. of a heated specimen and its variations in length. The specimen is enclosed in a silica tube and has a central aperture contg. the pyrometer needle, which consists of an alloy of 90-70% of Co or Ni, 10-25% of Cr, 0-5% of W, 0.2-0.6% of C, and 1-6% of Mn. A suitable construction is specified.

## 2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON AND EDWARD MACK

**Arabic chemistry.** E. J. HOLMYARD. *Nature* 109, 778-9(1922).—Quotations of historical interest from the work of the Arabian chemist, Mastima al-Majriti.

W. H. ROSS

**Recent advances in science—Physical chemistry.** W. E. GARNER. *Sci. Progress* 17, 22-7(1922).—Review of recent work on ionization and chem. reaction, active H and N, photochem. processes, elec. phenomena in heterogeneous systems, and boundary lubrication.

JOSEPH S. HEPBURN

**The foundation for chemical development.** W. A. NOYES. *J. Ind. Eng. Chem*

14, 779-80(1922).—A broad and thorough education and the acquisition of the habit of research make the best foundation for chem. development. E. J. C.

Pittsburgh as a chemical research center. WM. A. HAMOR. *J. Ind. Eng. Chem.* 14, 764-71(1922). E. J. C.

Pittsburgh as a center of chemical education. E. H. McCLELLAND. *J. Ind. Eng. Chem.* 14, 776-9(1922). E. J. C.

Dimensions of atoms and molecules. W. L. BRAGG. *Sci. Progress* 16, 45-55 (1921).—The methods used for the detn. of these dimensions are described; and a résumé is given of the results obtained. JOSEPH S. HEPBURN

International Union of Pure and Applied Chemistry. (Standards for low temperatures.) ANON. *Analyst* 47, 207-8(1922).—The m. ps. of the following compds. have been detd. by the Cryogenic Lab., Leyden Univ., by means of a He thermometer, and are suggested for adoption:  $\text{CCl}_4$ ,  $-22.9^\circ$ ,  $\text{PhCl}$   $-45.2^\circ$ ,  $\text{CHCl}_3$   $-63.5^\circ$ ,  $\text{EtOAc}$   $-83.6^\circ$ ,  $\text{PhMe}$   $-95.1^\circ$ ,  $\text{CS}_2$   $-111.6^\circ$ ,  $\text{Et}_2\text{O}$  (stable)  $-116.8^\circ$ ,  $\text{Et}_2\text{O}$  (unstable)  $-123.3^\circ$ , methylcyclohexane  $-126.3^\circ$ ,  $\text{Me}_3\text{CHEt}$   $-159.6^\circ$ . C. C. DAVIS

The daily analysis of outdoor air from November 1919 to November 1920. W. M. BOOTHBY AND K. SANDIFORD. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 55, 295-6 (1921).—The av. of 974 analyses of outdoor air at Rochester, Minn. is:  $\text{CO}_2$  0.367%, O 20.927%, N and other non-absorbable gases 79.037%. Throughout the year  $\text{CO}_2$  remains essentially unchanged and shows no seasonal variation. J. F. LYMAN

Pressures and specific gravities of the air in the normal atmosphere. A. RATEAU. *Compt. rend.* 174, 1593-1604(1922).—A discussion of the change of pressure and sp. gr. of the air with the altitude. E. P. WIGHTMAN

Velocity of sound in air and hydrogen at  $0^\circ$  and one atmosphere. F. GRÜNEISEN AND E. MERKEL. *Ann. Physik.* [iv] 66, 344-64(1921).—The velocity of sound in air is 331.57 m./sec. and in H 1260.6 m./sec. The ratio of the sp. heats for air is  $C_p/C_v = 1.4034$  and for H 1.408, both at  $0^\circ$  and 760 mm. J. C. S.

Physico-chemical studies with tetralin and decalin. W. HERZ AND P. SCHUFTAN. *Z. physik. Chem.* 101, 269-85(1922).—Detns. have been made of the following constns. of tetralin ( $T$ ) and decalin ( $D$ ): heat of vaporization,  $T = 79.32$  cal.,  $D = 71.01$  cal.; ebullioscopic const.,  $T = 5773$ ,  $D = 6036$ ; sp. heat,  $T = 0.403$ ,  $D = 0.395$ ; viscosity at  $25^\circ$ ,  $T = 2.240$ ,  $D = 2.701$ ; surface tension at  $60^\circ$ ,  $T = 21.13$ ,  $D = 26.73$ ; crit. temp.,  $T = 789^\circ$ ,  $D = 724^\circ$ . The d. of the 2 substances is given by the equation  $d_t = d_0 (1 - Kt)$ . For  $T$ ,  $d_0 = 0.9843$  and  $K = 763 \times 10^{-6}$ ; for  $D$ ,  $d_0 = 0.8975$  and  $K = 818 \times 10^{-6}$ . Measurements have been made of the distribution of  $T$ ,  $\text{HgCl}_2$ ,  $\text{CH}_3\text{CO}_2\text{H}$  and picric acid between  $\text{H}_2\text{O}$  and  $T$ , and of  $T$  and  $\text{CH}_3\text{CO}_2\text{H}$  between  $\text{H}_2\text{O}$  and  $D$ . The viscosity and d. of mixts. of  $T$  with  $\text{MeOH}$ ,  $\text{EtOH}$  and  $\text{BuOH}$  and of  $D$  with  $\text{BuOH}$  have been detd. H. JERMAIN CREIGHTON

Relative volumes of the chemical elements. H. COLLINS. *Chem. News* 122, 76-7; 123, 95-7(1921).—In the first part, a table is given of the relative vols. and the ds. of a no. of org. compds.; the latter quantity is compared with the experimentally detd. values. The calcd. results are based on the hypothesis previously put forward by C. In the second part, a further long list is given. It is shown that the exptl. facts obtained from the examn. of 76 mols. demonstrates that one relative vol. of H is 15.25 at  $15^\circ$  whether, Cl, Br, I,  $\text{NH}_3$ ,  $\text{NO}_2$ , SH,  $\text{C}_2\text{H}_2$ ,  $\text{C}_2\text{H}$ ,  $\text{CO}_2\text{Me}$ ,  $\text{CO}_2\text{Et}$ ,  $\text{CO}_2\text{Pr}$ ,  $\text{CO}_2\text{H}$  or  $-\text{OH}$  be displaced; in this case  $-\text{OH} = 13.29$ . In a further series of 24 compds., the relative vol. of H is 12.22 at  $15^\circ$  for the same replacements;  $\text{OH} = 10.21$ . The Me group has a vol. 31.67 at one end of a chain and 28.64 at the other end. When an atom of H the vol. of which is 15.25 is displaced by Me, the vol. of the latter is 31.67, and



encies of C concerned are distinguished by the fact that one (first position) has H with a vol. 15.25 and the other (second position) has H with a vol. 12.22. J. C. S.

**The crystal structure of phosphonium iodide.** R. G. DICKINSON. *J. Am. Chem. Soc.* **44**, 1489-97(1922).—The crystal structure of phosphonium iodide has been studied, the data being taken chiefly from Laue photographs and use being made of information furnished by the theory of space groups. It is shown that the data are in accord with a structure obtained by placing in a unit of dimensions  $6.34 \times 6.34 \times 4.62$  Å, P atoms at (000) and  $(\frac{1}{2}, \frac{1}{2}, 0)$  and I atoms at  $(0, \frac{1}{2}, u)$  and  $(0, \frac{1}{2}, \bar{u})$  where  $u$  is very close to 0.40; and it is shown that no simpler structure is capable of accounting for the data. The close relation between this structure and that of the low-temp. form of  $\text{NH}_4\text{Cl}$  is pointed out. RALPH W. G. WYCKOFF

**The crystal structure of ice.** W. H. BRAGG. *Proc. Phys. Soc. London* **34**, 98-103 (1922).—By assuming that each positive ion is surrounded symmetrically by negative ions and by making use of the data of Dennison (*C. A.* **15**, 783) a structure for ice is suggested which is in agreement with these data. Each O atom is at the center of gravity of 4 neighboring O atoms, from each of which it is sepd. by a H atom. The dimensions of the structure agree with Dennison's figures. RALPH W. G. WYCKOFF

**The crystal structure of periclase.** E. SCHIEBOLD. *Z. Krist.* **56**, 430(1921).—In agreement with the independent work of Hull, *et al.* (cf. Wyckoff, *C. A.* **15**, 1235),  $\text{MgO}$  is found to have the NaCl structure. Intensity measurements of different X-ray spectrum lines do not, however, agree with the view that  $\text{Mg}^{++}$  and  $\text{O}^{--}$  ions are present. E. T. W.

**The structure of alum.** J. J. P. VALETON. *Z. Krist.* **56**, 434(1921).—The growth velocity of different faces of a crystal is connected with the at. or mol. structure in the direction of each. Measurements on alum show the velocities on 3 important faces (111), (110), and (100), to be  $= 1 : 3.5 : 7$ . The (110) planes contain complete  $\text{KAl}(\text{SO}_4)_2$  mols. and consequently grow fairly slowly. The (100) ones show alternating layers of metal and radical. The (111) faces grew still more slowly than (110) because the  $(\text{SO}_4)$  radicals are distorted in them. E. T. WHERRY

**The structure of organic crystals.** WILLIAM BRAGG. *Nature* **110**, 115-7(1922).—A discourse. W. H. ROSS

**Photography of opaque crystals.** M. FRANCOIS AND CH. LORMAND. *Bull. soc. chim.* **29**, 1056-9(1921). Stereoscopic photography of crystals. *Ibid.* 1059-63.—Of photomicrographic rather than of chem. interest. E. J. C.

**Two properties of powders.** A. M. WILLIAMS. *Trans. Faraday Soc.*, adv. proof, June 28(1922).—The first property referred to is specific surface, which Ostwald has defined as the surface area of unit vol., but which W. thinks should be referred to unit mass. The second property is heat evolution on immersion of the powder in a liquid. The latter may be independent of chem. reaction and of soln. It is due to the compression of the liquid around the particles under the action of the cohesive forces at the surface of the powder. The reason for substituting unit mass for unit vol. is the difficulty of measuring the latter in the case of substances in a state of fine division. By combining observations on the heat of immersion with those on apparent sp. vol. for the same material in different stages of subdivision in the same liquid, we should be able to obtain the true sp. vol. with zero or negligible surface. An equation is worked out which it is believed would make it possible to distinguish between phys. and chem. changes. If the graph obtained is a straight line, it would indicate a mixt. of two substances or the presence of one chem. individual in different degrees of dispersivity. II. Expansion and shrinkage during caking of potassium carbonate. T. M. LOWRY AND E. E. WALKER. *Ibid.*—Photographic evidence is given of the expansion and subsequent shrinkage of an old package of  $\text{K}_2\text{CO}_3$ , after it was emptied into a jar. L. and W. were unable to repro-

duce these results exptly. A possible theoretical explanation of the expansion assumes the presence of a sesquihydrate, which expands on conversion into the dihydrate. Data are given for methods of prepn. of this sesquihydrate and for its *d.* III. **Powdering of minerals by decrepitation.** T. MARTIN LOWRY AND L. P. MCHATTON. *Ibid.*—The decrepitation of barytes has been noticed and 5 specific cases are given in which this property has been observed and utilized in the sepn. of zinc blende from barytes, the sp. gr. being 4.48 for barytes, and 4.06 for zinc blende, too close for sepn. by jigging. The authors investigated the matter further and found that decrepitation was due to the presence of included water, and that certain of the types of natural barytes contained little or no water and did not decrepitate when heated. Expts. were made which showed that the fineness of the powders produced when barytes, celestine, crocoite, and common salt were caused to decrepitate varied with the amts. of included water originally present.

JAS. O. HANDY

**Adsorption problems. The sorption of vapors by charcoal.** B. GUSTAV. *Kolloidchem. Beihfte* 15, 185-338(1922).—To designate the taking up by porous substances such as charcoal of gases or vapors much confusion would be avoided by the use of sorption (cf. *C. A.* 4, 706) sorb and sorbent instead of adsorption, adsorb and adsorbent. The sorption isotherms were detd. for  $H_2O$ , EtOH and AcOH at 20°, 25°, 30° and 35° with animal charcoal as the sorbent and confirmed what has been shown by other methods, *viz.*, that sorption is not a uniform process. Before a series of expts., the charcoal was heated to 400° in a vacuum for about 1 hr. The app. was arranged so that the vapors could be admitted to the charcoal in small portions and the sorption equil. at each point could be obtained from above and from below, *i. e.*, when the charcoal took up the vapors at a max. pressure or gave up the vapors towards a vacuum. The isotherms were a straight line ( $H_2O$ ) or concave to the pressure axis (EtOH and AcOH), to a point marked O. This point for  $H_2O$  was independent of the expt. temp. and was reached at the relative pressure  $p/P = 0.3-0.4$  in which  $P$  is the max. pressure of the vapor. The pressure coordinate for O on the EtOH isotherms increased with the temp. to 30° where  $p/P = 0.116$  and then fell to 0.038 at 35°. At O the curves rose abruptly and were convex to the pressure axis ( $H_2O$ ) or turned so as to form a wedge-shaped portion of the curve with the point O extending outward on the pressure axis (EtOH and AcOH). The first part of the curves to O corresponded to a reversible process. Beyond O equil. was always established much more quickly from below than from above, hysteresis. These results were explained in the same way as for sorption through gels. At first adsorption occurs. Beyond O sorption is principally condensation of the liquid in the pores of the charcoal. Hysteresis was explained by the difference in curvature of the meniscus during sorption and desorption as suggested by Zsigmondy for silicic acid gels (cf. *Kolloidchemie*, 214). Adsorption equil. was established after 30 sec. The velocity const. for adsorption was given by the equation,

$$k = \frac{1}{t \cdot p_\infty} \left( \log \frac{p}{p - p_\infty} - \log \frac{p_0}{p_0 - p_\infty} \right) \text{ in which } p_0 \text{ is the pressure at the beginning}$$

and  $p_\infty$  the pressure at equil. This equation is identical with Langmuir's (cf. *C. A.* 12, 2152). By means of the equation derived and the method used by Andersson (cf. *C. A.* 8, 3141), the radius of the capillaries were calcd. to be  $< 6.2 \times 10^{-4}$  cm. and the total surface of all the capillaries for 1 g. of charcoal to be  $> 3000$  m<sup>2</sup>. Trouton's sorption rule that vol. of a liquid and not the mass taken up is independent of the temp. and only a function of the relative pressure, was only approx. correct for these expts.

H. M. McLAUGHLIN

**The relation between adsorption and electrolytic dissociation.** M. A. RAKUSIN. *Biochem. Z.* 130, 282-5(1922).—An explanation of the observation that no Na light was given when NaCl soln. was put on a fragment of clay plate in a gas flame. F. S. H.

**The adsorption of iron by manganese dioxide.** MAX GELOSO. *Compt. rend.* **174**, 1629-31(1922).—The ppt. formed in an acid soln. of iron, by the action of  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  on a salt of Mn is represented by  $\text{MnO}_2 \cdot x\text{H}_2\text{O}$ ;  $x$  varies according to the amt. of iron in soln. Results of expts. are tabulated, showing that the amt. of iron adsorbed decreases as the concn. of  $\text{H}_2\text{SO}_4$  increases, and increases as the concn. of Mn increases. A close parallelism exists between the hydrolysis of ferric salts and adsorption. The adsorbed iron was in the form of a hydrate and not a sulfate.

D. T. EWING

**Origin of the charge of a colloidal particle and its neutralization by electrolytes.** J. N. MUKHERJEE. *Trans. Faraday Soc.* **16**, Appendix, 103-15(1921).—The charge of a number of suspensoids has been shown to be due to the adsorption of a common ion and the nature of the chem. forces which cause this adsorption has been defined. The effect of the elec. charge of a surface (due to the disorption of ions) on ions of opposite sign has been theoretically investigated for the case when chem. action does not take place between the surface and the ion. It has been shown that the elec. forces are sufficiently strong to account for adsorption. The stability of the adsorption of an ion of opposite sign by elec. forces has been given a quant. form, assuming that the charge of the surface consists of ions which can be treated as point charges widely sepd. from each other. Actual calcs. justified this assumption. The reversal of the charge by elec. adsorption has been discussed. The following series of the adsorbability of cations by a negatively charged surface has been deduced from the theory:  $\text{Th}^{++++} > \text{Al}^{+++} > \text{Ba}^{++} > \text{Sr}^{++} > \text{Ca}^{++} > \text{Mg}^{++} > \text{H}^+ > \text{Cs}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$ . This order is the same as that of the pptg. power of these ions for a number of suspensoids of widely differing chem. properties. Equations deduced from the theory agree satisfactorily with the exptl. observations of Elissafoff (*C. A.* **6**, 2348) on electro-endosmosis. The chem. affinity of the surface atoms is not always negligible, and for this reason the series given above cannot be expected to hold in all cases.

J. C. S.

**Electrical theory of adsorption.** W. HARRISON. *Trans. Faraday Soc.* **16**, Appendix, 116-118(1921).—A criticism of Mukherjee's theory of adsorption (cf. above). H. is of the opinion that the double layer consists of a surface of rigidly fixed atoms under continuous bombardment of positively and negatively charged ions, any particular point on the rigid surface becoming in turn negative, neutral, and positive, these conditions arising in any order. The observed contact difference is the av. effect of these conditions. When several kinds of atoms are present in the soln., the av. no. of any one of them at the surface will depend on their concn., valency, and mobility. The variation of contact difference from negative to neutral and positive was observed with cotton and  $\text{Al}_2(\text{SO}_4)_3$  near the neutral point (*J. Soc. Dyers Colourists* **27**, 279(1911); **34**, 91(1918)). These variations occurred during the same expt., the readings being direct measurements of e. m. f. developed by filtration under pressure.

J. C. S.

**The adsorption theory of striated precipitates.** S. C. BRADFORD. *Kolloid-Z.* **30**, 364-7(1922).—This is a summary of the theory already described (*C. A.* **10**, 3075; **11**, 2746; **14**, 1775).

F. L. BROWNE

**Colloid chemistry.** JEROME ALEXANDER. *J. Ind. Eng. Chem.* **14**, 800-2(1922).—Colloid Chemistry is a distinct zone in the chem. field. Many theoretical and tech. applications are given. No new data or theories are presented.

F. E. BROWN

**Energy principles in the coagulation of colloids, especially in "thermo-kinetic" coagulation-mechanism.** R. FRICKE. *Z. physik. Chem.* **101**, 185-92(1922).—The heats of reaction of several ideal coagulation processes and gas dispersoids have been calcd. on the basis of the "thermo-kinetic shadow theory." The small values obtained agree with those calcd. from the work involved in osmotic and lattice sepn. The different heat effects which arise during coagulation are discussed briefly, and it is shown that the larger part of the heat is due to the work of electrostatic discharge. The

coagulation of discharged colloids in the case of hydrosols is conditioned primarily by intermol. (lattice) forces, and secondarily by "thermo-kinetic shadow action." In gas dispersed systems the latter factor plays an important role in true flocculation.

H. JERMAIN CREIGHTON

**Freezing of hydrosols.** A. LOTTERMOSER. *Kolloid Z.* 30, 133(1922).—A complaint that Gutfier (cf. *C. A.* 16, 861) has used L.'s statements in connection with the influence of freezing on sols in a manner opposite to that which L. has intended. This has arisen because L.'s statements have not been understood in the sense demanded by the context.

J. C. S.

**Influence of freezing on colloidal selenium.** III. A. GUTBIER AND R. EMSLANDER. *Kolloid Z.* 30, 97-110(1922); *C. A.* 16, 182, 861.—Further expts. on the effect of freezing on Se sols are described. Se sols prep'd. by means of hydrazine hydrate are stable toward freezing when of suitable concn., even in the presence of large concns. of  $H_2SeO_4$ . The stability of such sols is dependent on the temp. of formation to a marked extent. A particularly stable system is formed when a 0.002 *M* soln. of  $SeO_2$  is reduced by a 1 : 2000 soln. of hydrazine hydrate at 60°, ten pts. of  $SeO_2$  soln. being reduced by one pt. of hydrazine hydrate. The coagulation of Se sols is greatly accelerated by freezing. Se sols may be prep'd. by the soln. of Se in hydrazine hydrate at ordinary temp. and pouring this mol. disperse system into a large vol. of water. With this system, it is shown that the stability of colloidal Se depends mainly on the degree of dispersion. It is also shown that an optimum concn. of electrolyte is necessary for the stability of Se hydrosols. In the absence of electrolytes, this system is quite unstable toward freezing. The protective action of the Na salts of protalbic and lysalbic acids on Se sols consists in a retardation of the spontaneous coagulation of the suspensoid.

J. C. S.

**Solutions and sols. Detersive action of soap.** CAMILLE GILLET. *Rev. gen. mat. color.* 25, 181-5(1921); 27, 1-6, 22-4, 39-43, 65-9, 88-93(1922).—(1) Liquid water is an equil. mixt. of hydrol ( $H_2O$ ), dihydrol ( $H_2O_2$ ), and polyhydrol ( $H_4O_n$ ); the first plays the principal role and it alone is studied. (2) The mol. of hydrol is very reactive, like all substances in the nascent state; it combines with acid or basic substances. (3) The mol. of hydrol exhibits the property of tautomerism like acetone, isatin, acetylacetic ester, etc.; according to the acid or basic nature of the medium, the material of the mol. assumes a definite arrangement. (4) An aq. soln. is a liquid body resulting from the reaction of hydrol with certain mols. The characteristic of this combination is the state of dissociation which exists therein. (5) The combination between hydrol and "soluble" substances is stable only when the coeff. of dissociation is less than that of hydrol. (6) Solns. with the same osmotic pressure contain the same no. of mols. of hydrol and not the same no. of dissolved mols. (7) Every dissolved mol. exists in a gaseous atm. whose mols. bombarding the dissolved mol. unequally, prevent it from obeying the laws of gravity. (8) The sol is a heterogeneous medium like the soln. but presents the phenomenon of Tyndall. Solns. flocculate when the micellae become too heavy to be held in suspension by the gaseous atm. of hydrol. A soln. contg. the dissolved substances seps. more or less completely into 2 portions. The micellae increase by the addition of water, while crystals form in the chem. way in a soln. satd. by loss of water. (9) The presence in the sols of dissolved mols. and the formation of micellae furnish a basis for the explanation of the detersive action of soap and the formation of emulsions. (10) The flocculation of solns. and of sols by electrolytes is easily explained by the light of these exptl. studies; it is the same as the reciprocal pptn. of 2 solns.

L. W. RIGGS

**Dispersivity and surface phenomena.** W. A. OSBORNE. *Proc. Physiol. Soc., J. Physiol.* 54, lxxix(1921).—An explanation is given for the diminution of catalytic action when the dispersivity exceeds the ordinary colloidal and approaches that of true

sols. The surface phenomena are referable to unbalanced mol. forces. If the diam. of a colloid particle is smaller than the range of mol. attraction (*i. e.*, 10 mol. diam.) the strain must be less owing to the diminished no. of mols. whose forces come into play. Finally when the particle is of mol. size, lack of balance may be said to be absent.

J. F. LYMAN

**Theory of Brownian movement.** G. JÄGER. *Sitzb. Akad. Wiss. Wien (2a)* 128, 1271, 1298(1919).—Stokes's law is held to be inapplicable in the case of Brownian movement. It is shown from consideration of mech. examples that if this law holds, osmotic pressure must be exerted as a continuous force and the consequences of Einstein's equation for Brownian movement and the calcn. of mol. size from diffusion are justified. The distribution of energy for particles of any no. of mols. may be obtained from Maxwell's law directly by gradual building up of groups from mols. The velocity of particles relative to the liquid medium, including their Brownian movement, is only to a small degree dependent on their mass.

J. C. S.

**Some fundamental conceptions of colloidal chemistry. Electrical charge on particles and the new conception of "micelle."** RICHARD ZSIGMONDY. *Z. physik. Chem.* 101, 292–322(1922).—A discussion.

H. JERMAIN CREIGHTON

**Variously colored modifications of colloidal copper.** C. PAAL AND H. STEYER. *Kolloid-Z.* 30, 88–97(1922).—Colloidal Cu exists in reddish brown, blue, two ruby-red, brown, olive, and green modifications. The ruby-red varieties and the blue variety can be prep'd. by reducing Cu hydroxide sols with hydrazine hydrate in ammoniacal sols. of lysalbinic acid and protalbinic acid and their Na salts.

J. S. C. I.

**Action of some mixtures of salts on swollen gelatin.** A. SCALA. *Ann. Igene* 31, 289–305(1921); cf. *C. A.* 15, 2644.—Gelatin absorbs salts up to a max. *e. g.*, 2 g. per 100 g. of dry gelatin for NaCl. The absorbed salt is not completely removed by washing. Na<sub>2</sub>HPO<sub>4</sub> and NaCl are absorbed from a mixt. exactly as though they were sep. There is no connection between the reaction of the water and the amt. of salt absorbed. NaCl represses swelling; Na<sub>2</sub>HPO<sub>4</sub> increases it.

J. S. C. I.

**Protective colloids—a pretty lecture experiment.** J. N. FRIEND. *Nature* 109, 341(1922); cf. *C. A.* 16, 2626.—Protective colloids, or org. emulsoids, tend to retard the velocities of such reactions as involve a change of state in one or more of the components. A lecture expt. illustrating this retardation is afforded by the pptn. of HgI<sub>2</sub> on the addition of the chloride to KI. In dil. soln. the unstable yellow form is first pptd. and rapidly turns from orange to red. In a 1% gelatin soln. the liquid first turns momentarily yellow because of the formation of colloidal HgI<sub>2</sub>, then becomes turbid and develops a beautiful canary color which remains unchanged for 1/2 hr. or more before changing slowly to red.

W. H. ROSS

**Progress on emulsions.** L. W. PARSONS. *J. Ind. Eng. Chem.* 14, 797–8(1922).

E. J. C.

**Surface tensions of oil-water interfaces.** H. HARTRIDGE AND R. A. PETERS. *Proc. Physiol. Soc., J. Physiol.* 54, xli(1921).—The surface tension developed at the interface between an oil and H<sub>2</sub>O varies with the  $p_H$  of the H<sub>2</sub>O. When the  $p_H$  is low (acid) the surface tension is high and *vice versa*. Near the neutral point, with olive oil, there is a fall in the surface tension of about 35% for a change of  $p_H = 1$ . For paraffin and H<sub>2</sub>O no such fall was observed and for benzene the fall was variable and very small.

J. F. LYMAN

**Viscosity determinations by means of orifices and short tubes.** W. N. BOND. *Proc. Phys. Soc. London* 34, 139–44(1922).—The end-corrections to be applied in the detn. of the viscosity of liquids by flow through tubes, are investigated, and the equations to be used with this method of viscosity measurement are given.

C. C. V. V.

**Partition of chlorine between water and a gaseous phase.** W. S. TROV. *Nachr.*

*Physik.-chem. lab. Semsoinsés* 1917, 102-10.—The partition of Cl at 20° between water and air contg. this gas is given by the formula  $(y - 1.748)^{1/2}x^3 = (72.52)^{1/2}$ , where  $x$  is the vol. of Cl per thousand vols. of air and  $y$  is the vol. dissolved in the water under the corresponding partial pressure. E. g., when  $x = 10$  parts per thousand,  $y = 74.27$  under a partial pressure of 7.6 mm.

J. C. S.

**Theory of concentrated solutions. Separation of solids from organic mixtures.**

J. TIMMERMANS. *Bull. soc. chim. Belg.* 30, 276-90(1921); cf. *C. A.* 3, 1608.—From a study of exptl. data in the literature relating to the f. ps. of binary org. mixts., it is concluded that deviations from the behavior of ideal mixts. cannot in all cases be accounted for by assuming combination between the components or polymerization, as suggested by Dolezalek and others (*C. A.* 3, 602; also Ikeda, *J. Coll. Sci. Tokyo* 25, X, 1-80(1908)). It is necessary to take into account also certain physical factors, in the sense of van der Waals's theory, in particular for systems of limited mutual soly. A provisional scheme of classification of binary org. liquids is based on these chem. and phys. factors. F. p. data respecting numerous binary mixts. contg. benzene as the crystg. component were compared with the ideal curve obtained by plotting  $T$  and  $C$  from the thermodynamic equation:  $\log_e C = Q(T_0 - T)/2T_0T$ , in which  $Q$  is the mol. heat of fusion of the component which seps.,  $C$  is the no. of mols. of the latter per 100 mols. of the mixt.,  $T$  is the temp. at which this component seps., and  $T_0$  is the solidifying point of the same substance in the pure state (cf. Washburn, "Introduction to the Principles of Physical Chemistry," 1915, ch. 14). Exptl. data for many of the mixts. agreed well with the curve, especially where the two components were closely related and not of widely different chem. character. Deviations from the curve in the direction of the axis of compn. might reasonably be attributed to combination between the components, but deviations in the other direction could not in all cases be due entirely to polymerization, and it is shown that they are to be expected if mixed crystals sep. or if the components are not completely miscible in all proportions (cf. Kohnstamm, *C. A.* 5, 1015). Similar considerations apply also to b. p. curves, but abnormalities are here more frequent than with f. p. curves. In many cases where the b. p. curve is convex towards the axis of compn. (cf. Dolezalek, *loc. cit.*), the assumption of polymerization sufficient to account for the abnormality appears inadmissible (for example, for  $\text{CCl}_4$ , benzene, toluene, etc.), and here again the results may be due to the existence of a range of immiscibility. This explanation was verified in a number of cases, the suspected mixts. sepg. into two liquid phases when their temp. was lowered sufficiently, by means of liquid air or solid  $\text{CO}_2$ .

J. C. S.

**Relation of the Dolezalek solution theory to that of Planck.** H. CASSIR. *Z. physik. Chem.* 101, 235-7(1922).—A mathematical paper in which it is shown that the range of applicability of the 2 theories is the same.

H. JERMAIN CREIGHTON

**Equilibrium law of electrolytes.** K. JABLZYŃSKI AND F. J. WISNIEWSKI. *Roczniki Chem.* 1, 116-34(1921).—The authors have deduced a diln. law of the form  $n^{1/2}/n_0 = k$  and have used this to calc. the value of  $k$  for K, Na, and Li chlorides, using data obtained from cryoscopic measurements. It is shown that only in the case of KCl is the value of  $k$  const., while in the case of the other two salts it may have even negative values. These facts are explained by hydration of the ions. Corrections which take into account the hydration have been introduced into van't Hoff's equation, and lead to a remarkably const. value for  $k$  in all three cases; thus for KCl  $k = 3.09$ , for NaCl 3.10, and for LiCl 2.93. Furthermore, the no. of mols. of water combined with the various ions has been calcd. as follows: K, 0; Na, 3; Li, 11; Cl, 0. HCl behaves in the same way as the salts mentioned, and when the H ion is taken as combined with 9 mols. of water a very const. value, 4.74, is obtained for  $k$ . The equation has been applied to those weak electrolytes which apparently follow Ostwald's diln. law. The value of  $k$  has

been calcd. for AcOH from cryoscopic measurements and a remarkably const. value 0.00504 obtained, whereas the value of  $k$  calcd. from Ostwald's equation increases considerably with increasing concn. On applying the equation to ebullioscopic data of solns. of the chlorides mentioned above, it is shown that the value of  $k$  increases even more strongly than when cryoscopic data are used. This is explained by assuming that the ions are more heavily hydrated at 100° than at 0°. This is shown to be in keeping with facts. The value of  $k$  at 100° is smaller than that at 0°, which shows that the degree of ionization decreases with increase of temp. This the authors attribute to a fall in the dielec. const. of water with increase of temp. A rule has been deduced, in keeping with facts, which shows that the equil. const. of salts in aq. soln. is proportional to the dielec. const. of the solvent.

J. C. S.

**Solubility of dextrose in water.** R. F. JACKSON and CLARA G. SILSBEE. *Bur. Standards, Sci. Papers* No. 437, 715-24(1922).—The equil. in the system, dextrose and water have been detd. For temps. below 90° three solid phases are capable of existence, namely, ice,  $\alpha$ -dextrose monohydrate, and anhydrous  $\alpha$ -dextrose. The f. p. curve was computed from the data of Roth and of Abegg. The cryohydric point, detd. graphically, lies at the temp.  $-5.3^\circ$  and concn. 31.75% dextrose. The solid phase,  $\alpha$ -dextrose monohydrate, which occurs in lustrous plates, is stable between  $-5.3^\circ$  and  $50^\circ$ . Its soly. shows a very high temp. coeff. Thus, at  $0.5^\circ$ , 100 parts of water dissolve 54.32 parts; at  $50^\circ$ , 243.76 parts of dextrose. The observed m. p.,  $80-90^\circ$ , although located far from the extrapolated soly. curve, is shown to be compatible with the measurements, on the theory that  $\beta$ -dextrose is present in the satd. soln. and absent during a m. p. detn. Above the transition point,  $50^\circ$ , the anhydrous form becomes stable. The soly. measurements of this phase in metastable state were continued down to  $28^\circ$ .

JAMES M. BELL

**Transport of matter in crystals and conglomerates.** G. v. HEVESY. *Z. Physik* 10, 80-3(1922).—By comparing the elec. cond. of  $\text{NaNO}_3$  and  $\text{CaCO}_3$  in form of large crystals and small crystal conglomerates, it was found that the former state has a resistance some 50 times as much as the latter for both substances. This indicates that the conducting mechanism is not a displacement of ion-columns throughout the crystal. The assumption is that transport of matter is dependent on the appearance of "loosened spots" in the crystal lattice, at which points change of position of ions can take place. Thus deviation from the ideal lattice form, such as irregular order of ions in crystal surfaces, favors elec. transport of matter. These surface effects would, of course, predominate in conglomerates.

A. E. STEARN

**Significance of the second dissociation constant of uric acid for the equilibrium of monourate solution.** A. KANITZ. *Z. physiol. Chem.* 116, 96-106(1921).—Correction of journal reference in *C. A.* 16, 2439.

E. J. C.

**Active hydrogen and nitrogen.** G. L. WENDT. *Nature* 109, 749(1922).—The failure of the active N reported by Newman (*C. A.* 16, 2069) to give with S, P and I a reaction product contg. nitrides is not evidence of the absence of a chem. reaction between these elements and N, for all three are more electronegative than N and the compds. formed would be sulfides, phosphides and iodides, resp. Further the evolution of gas, when the bulb in which these same elements had been exposed to active H was heated from  $-40^\circ$  to  $100^\circ$ , is not evidence of the failure of these elements to react with the active H for the compds. formed would be  $\text{H}_2\text{S}$ ,  $\text{PH}_3$  and  $\text{HI}$ , all of which are gaseous at the latter temp. although liquid at the former and would thus be evolved in the gaseous state when heated to increase the pressure as noted.

W. H. ROSS

**Kinetic study of alkaline solutions of iodine.** O. LIEVIN. *Compt. rend.* 174, 868-70(1922).—In the system  $0.005 \text{ I}_2 + 0.02 \text{ KI} + a \text{ NaOH}$ , when  $a > 0.01 \text{ M}$  the rate of disappearance of free I is very rapid and increases with  $a$ . The hypoiodite is

completely converted into iodate but persists longer the greater the concn. of NaOH. If  $t$  be the time in mins. required to complete the formation of half the iodate, then at  $a = 0.014 M$ ,  $t < 1$  min.; at  $0.04 M$ , 5 mins.; at  $0.05 M$ , 8 mins.; at  $0.10 M$ , 15 mins.; at  $0.20 M$ , 30 mins.; at  $0.40 M$ , 48 mins. In the system  $0.005 I_2 + bKI + 0.20 NaOH$  at  $10^\circ$ , when  $b = 0.03 M$ ,  $t = 35$  mins.;  $0.06 M$ , 18 mins.;  $0.11 M$ , 13 mins.;  $0.21 M$ , 7 mins.;  $0.41$ , 4 mins. The effect of diln. on the rate of formation of iodate in the system  $c(0.005 I_2 + 0.02 KI + 0.20 NaOH)$  is shown by the following figures: at  $c = 2$ ,  $t = 16$  min.;  $1$ , 30 min.;  $0.5$ , 55 min.;  $0.25$ , 120 min. The product  $d$  is very nearly const. and indicates a bimolecular reaction. When NaOH is replaced by KOH quite analogous results are obtained. The effect of adding  $Na_2CO_3$  and  $Na_3PO_4$  is different. In the system  $c(0.005 I_2 + 0.12 KI + 0.10 Na_2CO_3)$  at  $18.5^\circ$ , at  $c = 2$ ,  $t = 50$  mins.;  $1$ , 11 mins.;  $0.5$ , 3 min.; the velocity of transformation of  $I$  into iodate increases with the diln. The concn. of iodate does not influence the rate of transformation of  $I$  into iodate. In an alk. medium  $I$  is transformed into iodate by different mechanisms depending on the degree of alkalinity.

D. MACRAE

**Kinetics of reactions in which halogen atoms move from the inner sphere of action to the outer.** H. FREUNDLICH and R. BARTELS. *Z. physik. Chem.* 101, 177-84(1922).—The velocities of the following reactions have been studied quant., or semi-quant.:

(1)  $[Cr(NH_3)_5Br]^{++} + H_2O = [Cr(NH_3)_5H_2O]^{+++} + Br^-$ , (2)  $[Cr(NH_3)_5I]^{++} + H_2O = [Cr(NH_3)_5H_2O]^{+++} + I^-$ , (3)  $BrCH_2(CH_2)_3CH_2NH_2 = H_2C \begin{smallmatrix} CH_2 - CH_2 \\ | \quad | \\ CH_2 - CH_2 \end{smallmatrix}$ .

$NH_3^+ + Br^-$ , (4)  $ICH_2(CH_2)_3CH_2NH_2 = H_2C \begin{smallmatrix} CH_2 - CH_2 \\ | \quad | \\ CH_2 - CH_2 \end{smallmatrix} NH_3^+ + I^-$ , and the

velocities compared with those of the following reactions studied previously: (1)  $[Cr(NH_3)_5Cl]^{++} + H_2O = [Cr(NH_3)_5H_2O]^{+++} + Cl^-$ , (2)  $ClCH_2(CH_2)_3CH_2NH_2 = H_2C \begin{smallmatrix} CH_2 - CH_2 \\ | \quad | \\ CH_2 - CH_2 \end{smallmatrix} NH_2^+ + Cl^-$ , (3)  $[Co(NH_3)_5Cl]^{++} + H_2O = [Co(NH_3)_5H_2O]^{+++} + Cl^-$ , (4)  $[Co(NH_3)_5Br]^{++} + H_2O = [Co(NH_3)_5H_2O]^{+++} + Br^-$ . All of the foregoing reactions follow the velocity equations of the first order. The velocity consts. depend on the nature of the halogen atom as well as on that of the nuclear atom; and the consts. increase more than 1000-fold in the order  $Cl < Br < I$ , and considerably less in the order  $Co < Cr < C$ . The temp. coeffs., so far as measured, are very large, the const.  $H$  in the Arrhenius equation being about 10000.

H. JERMAIN CREIGHTON

**Catalysis and catalytic agents in chemical processes.** H. S. TAYLOR. *Chem. Age* (N. Y.) 30, 309-14; *J. Frank. Inst.* 194, 1-27(1922).—A lecture. Sections are devoted to: principles and methods of catalytic investigation, the form of the catalyst and catalyst support materials, theories of catalytic action, reactions at boundaries of phases and the problem of promoter action, and catalyst poisons. JOSEPH S. HEPBURN

**Peculiar catalytic action in chemical syntheses by silent discharge.** F. PANETH. *Z. physik. Chem.* 100, 367-71(1922).—The results obtained by Paneth, Matthies and Schmidt-Hebbel (cf. *C. A.* 16, 2088) in the formation of  $SnH_4$  by silent elec. discharge are discussed in relation to other chem. reactions brought about by elec. discharge. In agreement with Franck and Grottrian's hypothesis (cf. *C. A.* 15, 1884), it is supposed that the electrically excited H atoms carrying an electron with a higher quantum very readily give up their electron to the Sn atoms on collision with the atoms of the Sn vapor; and are thus able as positive nuclei to attach themselves to the negatively charged Sn. H. JERMAIN CREIGHTON

**Catalysis.** XIV. The action of nitric acid on metals and an example of a periodic reaction. B. C. BANERJI and N. R. DHAR. *Z. anorg. allgem. Chem.* 122, 73-80(1922); cf. *C. A.* 14, 2286.—The rate of soln. of Cu, Ag, Hg, Pb, Ni, mint Ag, brass, and Cu-Ni



alloy in nitric acid in the presence of various salts was studied by the method of weighing the strips of metal at intervals after immersion in the acid. Ferrous salts accelerate the soln. of the metals, while oxidizing agents such as  $\text{KMnO}_4$  and  $\text{KClO}_3$  retard the action. The facts are explained on the basis of the formation of nitrous acid from nitric in the presence of ferrous salts, the nitrous acid dissolving the metal more rapidly than nitric acid. A crystal of  $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4$  in 25% nitric acid is soon covered with the characteristic brown ring and gives off  $\text{NO}$ . Addn. of urea results in the rapid evolution of  $\text{N}_2$  and  $\text{CO}_2$ . With the 50% alloy of Ni and Cu the soln. in nitric acid takes place in reaction periods of diminishing length, each succeeded by a quiet period of no reaction. In one case the active periods lasted successively 12, 7, 5, 3 and 1 min.

F. L. BROWNE

Chemical reactions on surfaces. IRVING LANGMUIR. *Gen. Elec. Rev.* 25, 445-54 (1922).—See C. A. 16, 7. C. G. F.

The pressure variation of the equilibrium constant in dilute solution. A. M. WILLIAMS. *Trans. Faraday Soc.* 16, 458-63 (1921).—The expression obtained by Planck for the variation of the equil. const. of a reaction in dil. soln. with pressure is  $(\partial \log K) / \partial P = (V_1 - V_2) / RT$ , where  $K$  is calcd. for concns. which are molar fractions of the total number of mols. present, including the solvent, and  $V_1 - V_2$  denotes the vol. change during the reaction. Rice (*Trans. Faraday Soc.* 12, 318 (1917)) obtained a similar expression, but his  $K$  referred to vol. concns. An attempt to explain the discrepancy was made by Mazzucchelli (*C. A.* 14, 1478), but the explanation offered by him is now shown to be untenable. It is shown that the discrepancy is due to the different interpretations put upon the term  $(V_1 - V_2)$  by Rice. Denoting Rice's const. by  $K'$ , it is shown that  $(\partial \log K') / \partial P = [(\partial \log K) / \partial P] - \Sigma \lambda \beta$ , where  $\beta$  is the compressibility of the fluid and  $\Sigma \lambda$  is the change in the number of mols. involved in the reaction. An independent proof of the theorem from first principles is also presented. J. C. S.

Equilibrium in the system: potassium chlorate, potassium nitrate and water at 25°. S. TODA. *J. Chem. Soc. (Japan)* 43, 320-40 (1922).—By evap. a mixed. soln. of  $\text{KClO}_3$  and  $\text{KNO}_3$ , Herbetto obtained monoclinic crystals composed of the two salts, and pure rhombic crystals of  $\text{KNO}_3$ . Equil. in this system was studied by T. in detail. Both  $\text{KClO}_3$  and  $\text{KNO}_3$  were prepd. by recrystn. 3 times from the Japn. Pharm. products.  $\text{ClO}_3$  was estd. as Cl by R. and B.'s modification (see following abstract), of Volhard's method after boiling the soln. with 10%  $\text{FeSO}_4$  and removing  $\text{Fe}(\text{OH})_3$  by Cl-free  $\text{NH}_3$ ; K by the method described in Treadwell-Hall, and  $\text{NO}_3$  by the difference. The results show that 100 g. of  $\text{KClO}_3$  contains 7.745 g. of the salt, or 8.395 g. per 100 g.  $\text{H}_2\text{O}$ ; 100 g. of  $\text{KNO}_3$  soln. contains 27.24 of the salt or 37.44 g. per 100 g.  $\text{H}_2\text{O}$ . H.'s monoclinic double salt crystals contained 65%  $\text{ClO}_3$  or 39.47% of mol. equil. of  $\text{KNO}_3$ . T.'s crystals, however, contained  $\text{ClO}_3$  corresponding to only 14.37% of  $\text{KNO}_3$ ; this difference probably is due to the difference in temp.  $\text{KNO}_3$  on the other hand, dissolves  $\text{KClO}_3$ , and does not form a solid soln. S. T.

Oxychlorides of mercury. Equilibrium in the system: mercuric chloride, yellow mercuric oxide and water at 35°. S. TODA. *J. Chem. Soc. (Japan)* 43, 312-20 (1922).— $\text{HgCl}_2$  was prepd. by 3 recrystns. from hot water of the Japn. Pharm. product; the yellow oxide by Vanino's method. Appropriate amts. of these two compds. with  $\text{H}_2\text{O}$  were placed in a 30-cc. Erlenmeyer flask and kept constantly stirred at 35° for 3 days. The compn. of the liquid and solids was detd. by the usual methods. Cl was detd. by Rothmund and Burgastaller's modification of Volhard's method after sulfide was removed; Hg by Vanino's method. The results show that 100 g. of  $\text{HgCl}_2$  soln. contained 8.58 g.  $\text{HgCl}_2$ , or 9.39 g. is dissolved in 100 g.  $\text{H}_2\text{O}$ ; soly. of the yellow oxide is 0.0014 g. per 100 g.  $\text{H}_2\text{O}$  at 35°. In this system, at 35°, only  $\text{HgCl}_2 \cdot 2\text{H}_2\text{O}$  and  $\text{HgCl}_2 \cdot 4\text{H}_2\text{O}$  are formed.  $\text{HgCl}_2 \cdot 4\text{H}_2\text{O}$  forms a solid soln. with the yellow oxide,  $\text{HgO}$ . S. T.

**Binary liquid mixtures.** G. C. SCHMIDT. *Z. physik. Chem.* 101, 286-91(1922); cf. *C. A.* 16, 673.—Polemic.

H. JERMAIN CREIGHTON

**New data in the thermochemistry of organic substances.** W. SWIENTOSLAWSKI. *Roczniki Chem.* 1, 305-15(1921).—The heat of dissoc. of H, Cl, Br, I, and solid C into individual atoms, detd. during recent years, has been used to obtain the value of the const.  $\epsilon$  of the equations  $(C - I) = (H - I) + \epsilon - 3$ ;  $(C - Br) = (H - Br) + \epsilon - 3$ ;  $(C - Cl) = (H - Cl) + \epsilon$ ;  $(C - C) = (H - C) + \epsilon$ ;  $(C - N) = (H - N) + \epsilon$ ;  $(C - S) = (H - S) + \epsilon + 2$ ;  $(C - O) = (H - O) + \epsilon + 5$ ;  $(C - H) = (H - H) + \epsilon + 15$ . The symbols  $(C - I)$ ,  $(H - I)$  indicate the heat of formation of the single link between the atoms named. When the values 81.3 Cal., 106 Cal., 46 Cal., and 36 Cal. are taken as the heat of formation of the mols. of H, Cl, Br, and I, resp., as represented by  $2X - = X_2 + Q$  Cal., and the heat of formation of solid diamond as  $-C -$

$= C_{\text{sol}} \times 287$  Cal., it is possible to calc. the heat of formation of the links  $(C - C)$  and  $(C - H)$ . According to Fajans (*C. A.* 14, 3086),  $(C - C) = 137.5$  Cal. and  $(C - H) = 117.0$  Cal. By using the above data in the equations, a mean value of 20.6 is obtained for  $\epsilon$ . From the heat of formation of the linkings  $(H - Cl) = 115.5$  Cal.,  $(H - Br) = 72.0$  Cal.,  $(H - I) = 52.7$  Cal., it is shown that  $(C - Cl) = 136.3$  Cal.,  $(C - Br) = 89.7$  Cal., and  $(C - I) = 70.3$  Cal. An analysis of the above results shows that the heat of formation of a link is an additive quantity made up of parts due to the links of the atoms concerned. These parts have been calcd. as follows:  $(C -) = 68.8$  Cal.,  $(H -) = 48.2$  Cal.,  $(Cl -) = 67.4$  Cal.,  $(Br -) = 23.8$  Cal.,  $(I -) = 4.4$  Cal. The heat of formation of a link between two atoms is the sum of the two at. values. This regularity is probably existent in inorg. compounds also, for if the above at. values of the halogens are subtracted resp. from the heat of formation of the corresponding halides of K, the value of  $(K -)$  is found to be 91.2, 94.5, and 93.7 Cal., and by the same method the value for  $(Na -)$  is 83.3, 84.0, and 82.7 Cal. J. C. S.

**Heat-interchange between solid bodies and fluids of small viscosity and heat conductivity.** E. POHLHAUSEN. *Z. Math. Mechanik* 1, 115-21(1921); *Science Abstracts* 25A, 344.—Mathematical. H. G.

**General improvement of the equation of condition: Special equation of condition for hydrogen.** LÉON SCHAMES. *Physik. Z.* 22, 630-4(1921).—A theoretical paper in which the consts.  $a$  and  $b$  of van der Waals's equation are considered on the basis of a perfectly rigid atom. A general equation of condition is evolved, and taking account of the compressibility of the atoms the equation  $pv[1 - (b/v)] + a_0/v[\alpha - (v_0/v)] = RT$  is deduced for H. J. C. S.

**Physical properties of vapor-liquid systems. I.** W. SWIENTOSLAWSKI. *Roczniki Chem.* 1, 276-96(1921).—Starting from relationships based on van der Waals's hypothesis of corresponding conditions,  $\tau = T/T_c$  and  $d_c/d = K = f(\tau)$ , where  $T_c$  and  $d_c$  are the temp. and corresponding d. and  $T_c$  and  $d_c$  the same crit. values, S. has deduced the following regularities from the exptl. work of Young, Amagat, Mathias, Villard, Kamerlingh Onnes, and Crommelin. (1) The value of  $K$  or  $\log K$  increases with increasing mol. wt. of the liquid and also when the liquid is associated. (2) O and A have small values of  $K$ . In the case of associated liquids, it is shown that the concn. of non-associated mols.  $y$ , is given by  $y\% = 100K/K_A$ , where  $K = d_c/d_p$  for a non-associated liquid and  $K_A$  is the same ratio for an associated liquid at the same relative temp. ( $\tau = \text{const.}$ ). The concn. of non-associated mols. in MeOH and propyl alc. increases proportionally to the temp., but this is not true for EtOH. Ramsay's results for water and EtOH are satisfactory if it is assumed that the associated mol. of water contains 3 simple mols. and that of EtOH two simple mols. The value of  $K$

plays an important role in all cases where the phys. state of a system liquid-vapor is characterized. The relationship between the surface tension  $\gamma$  and the reduction of pressure below the meniscus in a capillary tube of radius  $r$  is given by  $(2\gamma/r\Delta f) \tau = K = \text{const.}$ , and in the case of osmotic pressure  $(P/\Delta f) = K = \text{const.}$  The const. of Trouton's rule may be calcd. by the equation  $W_{\text{mol}} = bR \log_e K = 20.4$ , in which  $R = 2 \text{ cal. log}_e K = 2.303$ ,  $\log_{10} K = 2.203 \times 2.38$  or  $2.38$ , depending on the ratio  $K = d_e/d_p$  for the liquid at the relative b. p.  $\tau = 0.65$  under a pressure of one atm. II. *Ibid* 297-304.—It is shown that over the range of relative temps.  $\tau = 0.50$  to  $\tau = 0.95$  the expression  $d_e^2/T \log_e K = B$  is const., where  $d_e$  is the density of the liquid, and  $K$  the ratio  $d_e/d_p$  in which  $d_p$  is the density of the vapor at the abs. temp.  $T$ . The deviations of  $B$  never exceed a mean amt. of  $\pm 2.3\%$ . A min. value of  $B$  is found between  $\tau = 0.85$  and  $0.90$  and a max. about  $\tau = 0.60 - 0.65$ . Associated liquids are exceptional; these show a continual increase in the value of  $B$  from  $\tau = 0.50$  to the crit. temp.  $\tau = 1$ . J. C. S.

**Proof of the equation for the compression of liquids from the data of Amagat and Bridgman.** H. CARL. *Z. physik. Chem.* 101, 238-68(1922).—The validity of the compression equation,  $\frac{e(v_0 - v)}{A} = 1 + (p - p_0)/(K + p_0)$  (I),  $V_0\alpha = A(\text{II})$ ,

$K = b(\tau) - C$  (III) adduced by Wohl (cf. *C. A.* 16, 869) has been verified for MeOH, EtOH, PrOH, i-BuOH, AmOH,  $(\text{CH}_3)_2\text{CO}$ ,  $\text{Et}_2\text{O}$ , EtCl, EtBr, EtI,  $\text{CS}_2$  and  $\text{PCl}_3$  with the isotherms of Amagat and Bridgman. The quantity  $K$  is a pressure magnitude for the internal pressure of the liquid, and  $\alpha$  is a const. which expresses the different initial resistances and the different mol. and at. distances in the liquid. Each of the foregoing normal liquids has a const. value for  $\alpha$  over the temp. range  $0-80^\circ$ . For all of the normal liquids the  $K$ -values conform to equation III over the same temp. interval. Up to pressures of  $2500 \text{ kg./cm.}^2$ ,  $\text{H}_2\text{O}$  exhibits anomalous vol. changes; but at temps. above  $50^\circ$  it behaves normally. Over the whole temp. range studied  $\alpha$  is const. The  $K$  values do not lie on a straight line. Similar anomalies are presented by EtOH at lower pressures. The agreement of  $v$  values calcd. by means of the equation with those obtained from the isotherms of Amagat is excellent. The compression equation is presented in a reduced form and values of the const. for different liquids are tabulated.

H. JERMAIN CRRIGHTON

**Melting and boiling point determinations of small quantities.** J. SCHNELLER. *Deutsches Z. ges. gerichtl. Med.* 1, 154-6(1922).—A description of small obvious technical details to be used in working with small amts. of materials. F. S. HAMMETT

**The ratio of melting point to boiling point.** R. LORENZ AND W. HERZ. *Z. anorg. allgem. Chem.* 122, 51-60(1922); cf. *C. A.* 10, 989, 1612.—From the collected data for the m. ps. ( $T_s$ , abs. temp.) and b. ps. ( $T_b$ ) of 33 elements, 122 inorg. compds. and 257 org. compds., it is shown that the av. value of  $T_s : T_b$  is: for elements 0.5583; inorg. compds. 0.7183; org. compds. 0.5839. The av. value for all is 0.62 instead of 0.68 previously suggested by L. W. M. McLAUGHLIN

**Measurement of small temperature variations by the ultra-micrometer.** W. SUCKSMITH. *Phil. Mag.* 43, 223-6(1922); *Science Abstracts* 25A, 219. H. G.

**An electrolytic preparation of calcium amalgam.** B. S. NEUBAUSSEN. *J. Am. Chem. Soc.* 44, 1445-7(1922).—A 1.75  $M$   $\text{CaCl}_2$  soln. is electrolyzed in a 25-centimeter crystg. dish with a thin layer of Hg on the bottom of the dish as a cathode. D. M.

**Are tantalum and columbium pentachlorides in the molten state conductors of electricity?** WILHELM BILTZ AND ARTHUR VOIGT. *Z. anorg. allgem. Chem.* 120, 71-6 (1921).—Carefully purified  $\text{TaCl}_5$  has a sp. cond. of  $0.30 \times 10^{-6}$  at  $230^\circ$ ,  $235^\circ$ , and  $240^\circ$  and  $\text{CbCl}_5$ ,  $0.22 \times 10^{-6}$  at  $220^\circ$ ,  $225^\circ$ , and  $230^\circ$ ,  $235^\circ$ . D. MACRAE

**The production of electromotive force by the movement of salt solution past silver**

**electrodes.** W. L. BROWN AND A. V. HILL. *Proc. Physiol. Soc., J. Physiol.* cix **54**, (1921).—Ag electrodes, coated with AgCl, show a difference of e. m. f. when a soln. of NaCl is running past either electrode, the electrode past which the stream is running becoming positive. It is suggested that this is due to a mech. effect of the stream in washing away the Cl ions of the elec. double layer there and so leaving the Ag positively charged. J. F. L.

**Anhydrous, paramagnetic compounds in the solid state and the magneton.** PH. THÉODORIDÈS. *J. physique radium* [6] **3**, 1-19(1922); cf. C. A. **15**, 622, 792; **16**, 1902.—The susceptibilities of several salts have been measured over a temp. interval of about 600°. **Conclusions.**—At 25° the coeffs. of sp. magnetization ( $\times 10^4$ ) of the ions  $\text{Fe}^{++}$ ,  $\text{Co}^{++}$ ,  $\text{Mn}^{++}$ , and  $\text{Ni}^{++}$ , in  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{CoSO}_4$ ,  $\text{MnSO}_4$ ,  $\text{MnO}$ ,  $\text{MnCl}_2$ ,  $\text{CoCl}_2$  and  $\text{NiCl}_2$  are 56.21, 62.25, 88.72, 67.46, 110.96, 96.29, and 45.57, resp. Over an interval of several hundred degrees the thermal variation of the coeff. of magnetization of these compds., except  $\text{MnCl}_2$ , is reversible and follows the generalized law of Curie. At 260°, 275°, and 275° the compds.  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{CoSO}_4$ , and  $\text{MnSO}_4$ , resp., present a reversible anomaly in the variation of the susceptibility.  $\text{Cr}_2\text{O}_3$  is not excited proportionally to the field. The curve  $(1/\chi)$  for this compd. presents a min. at 60° and a change of direction at 310°. The effects are reversible even after heating to 400°. **Calcs.**, following the generalized equation of Langevin, of the magnetic satns. of cations, furnish numbers which are favorable to the hypothesis of the at. structure of magnetism. The magnetic satn. of the ion  $\text{Co}^{++}$  in the sulfate and the chloride is found to be 24.99 magneton-grams: that of  $\text{Fe}^{++}$  in  $\text{Fe}_2(\text{SO}_4)_3$ , 28.95, of  $\text{Mn}^{++}$ , 29.04 and of  $\text{Ni}^{++}$  in  $\text{NiCl}_2$  it is 16.03 or 16.92 magneton-grams according to whether the thermal interval is 0 to 125° or 150° to 500°. For all the salts examd. the sign of the const. of the mol. field depends upon the nature of the anion of the compd. and not at all upon the cation.

F. P. PHELPS

**Present status of electric and magnetic units.** J. H. DELLINGER. *Phys. Rev.* **18**, 121-5(1921); *Science Abstracts* **25A**, 231-2. H. G.

**The determination of Poisson's ratio and of the absolute stress-variation of refractive index.** F. TWYMAN AND J. W. PERRY. *Proc. Phys. Soc. (London)* **34**, 151-4 (1922).—A simple method is described for detg. the stress-optical coeffs. by means of a Hilger interferometer. Young's modulus of elasticity and Poisson's ratio may be detd. simultaneously. C. C. VAN VOORHIS

**Standardization of colors.** H. TRELLICH. *Farben-Ztg.* **27**, 672-4(1921). E. J. C.

**ARRHENIUS, SVANTE: Die Chemie und das moderne Leben.** Edited by B. Finkelstein. Leipzig: Akademische Verlagsgesellschaft m. B. H. 373 pp. M 100, bound M 150.

**BRANDSTÄTTER, FRIEDR.: Chemische Schulversuche.** Vienna: von Pilchers Witwe & Sohn. M 50.

**COULTHARD, A.: First Book of Chemistry for Students in Junior Technical Schools.** London: I. Pitman & Sons, Ltd. 156 pp. 4s. 6d. Reviewed in *Nature* **109**, 774(1922).

**DE DONDER, TH.: Lecons de thermodynamique et de chimie physique.** Edited by Th. Van den Dungen and G. van Lerberghe. Paris: Gauthier-Villars et Cie. Reviewed in *Physica* **2**, 195(1922).

**EBELING, M.: Lehrbuch der Chemie und Mineralogie für höhere Lehranstalten. Part I. Anorganische Chemie.** 5th Revized ed. Part II. Organische Chemie. 3 Ed. Berlin: Weidmannsche Buchhandlung. Part I. M 20. Part II. M 24.

**GLAZEBROOK, RICHARD Vol. I.: Dictionary of Applied Physics.** In 5 vols. Edited by LONDON. Vol. 1. **Mechanics and Engineering—Heat.** London: MacMillan & Co. 1067 pp. £ 3, 3s. or \$15.

**GUYS, CH. EUG.: L'évolution chimique.** Paris: E. Chiron, 40, rue de Seine.

KIRCHBERGER, PAUL: *Entwicklung der Atomtheorie*. Karlsruhe: C. F. MÜLLER. 260 pp. M 60. Reviewed in *Papier-Zig.* 47, 2024(1922).

Les actualités de la chimie contemporaine. Paris: G. Doin.

LORENZ, RICHARD: *Wie findet man den Grenzwert des molaren Leitvermögens starker Elektrolyte*. Leipzig: Leopold Voss. M 20. 16 pp.

MARTIN, GEOFFREY, DICKSON, J. M. and CRISTELOW, J. W.: *Modern Chemical Lecture Diagrams*. London: Sampson Low, Marston & Co. 88 pp. 3s. 6d. Reviewed in *Chem. News* 125, No. 3248, 10(1922).

WASHBURN, EDW. W.: *Introduction to the Principles of Physical Chemistry from the Standpoint of Modern Atomistics and Thermodynamics*. Instruction for Students intending to enter Physics or Chemistry as a Profession. 2nd ed. revized and enlarged. New York: McGraw-Hill Book Co. 516 pp.

WHEELER, S. G.: *Entropy as a Tangible Conception*. New York: D. Van Nostrand Co. 76 pp. \$3. Reviewed in *Chem. Met. Eng.* 27, 34(1922).

WIEN, W.: *Aus der Welt der Wissenschaft*. Leipzig: J. A. Barth. 320 pp. M 72. Reviewed in *Pharm. Monatsh.* 385(1922).

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Isotopes of tin. F. H. LORING. *Chem. News* 125, 5-7(1922).—Speculative.

F. O. A.

Recent advances in science—Physics. J. RICE. *Sci. Progress* 17, 18-22(1922).—

Review of recent work on the problems of atomic structure. JOSEPH S. HEPBURN

Present conception of matter. H. S. TOY. *Sci. Progress* 17, 74-85(1922).—

A summary of present knowledge concerning the structure of the atom. J. S. H.

New conceptions of matter. G. M. J. MACKAY. *Gen. Elec. Rev.* 25, 508-13

(1922).—A review of the lectures by F. W. Aston.

C. G. F.

The structure and dimensions of molecules. A. O. RANKINE. *J. Röntgen Soc.* 18, 56-61(1922); cf. *C. A.* 16, 667.—The paper is a résumé of the various methods which have been used to obtain information on the structure and dimensions of mols. All of them involve the detn. of the no. of mols. per cc., the accepted no. at present being  $2.70 \times 10^{19}$ . The most reliable methods are those based on the viscosity of gases and X-ray analyses of crystal. Calcs. based on the Lewis-Langmuir theory of at. structure are able satisfactorily to explain the differences in values for the diams. of the mols. of Ne, A, Kr, Xe as calcd. by the above 2 methods and to enable the calcn. of values for the diams. of gaseous mols. such as the halogens, CO<sub>2</sub> and N<sub>2</sub>O which are consistent with the measured values of their viscosities. Nearly all of the substances which can be gotten into the gaseous state at convenient temps. contain H. A number of such have been studied by R., which on the Lewis-Langmuir theory have attained the electron arrangement of the inert gases Ne, A, Kr, Xe. In H<sub>2</sub>S for example while the S has an at. no. of only 16 it can be made up to 18, the at. n o. of A, by absorbing 2 electrons from 2 sep. H ats. The H<sub>2</sub>S mol. is therefore regarded as similar to an A mol. with 2 excrescences due to the H nuclei. Measurements of the mol. diams. by the viscosity method show that the excrescences representing the H nuclei seem to get larger as their number increases.

F. P. PHELPS

Refraction of light and atomic structure. Refraction equivalents of ions. JARL A. WASASTJERNA. *Öfvers. Finska Vet.-Soc.* 63, [A] No. 4, 18 pp.(1921).—Cuthbertson's rule for the relation between the refraction equivs. of atoms and their position in the periodic system is applicable to the refraction equivs. of the ions of the alkali and alk-earth metals. It follows that the outer electron sheath of an alkali metal contains only

one electron which in salt formation passes over to the acid half, which thereby becomes negative. In the case of alk.-earth metals the outer sheath contains two electrons which go over to the negative atom or group. The next sheath in the alkali and alk.-earth metals is identical with that in the preceding member of the horizontal series which is nearer to the nucleus on account of increased attraction. Numerical values are given for the refraction equiv. of positive and negative ions. J. C. S.

**Structure of the atom and molecule in the light of the dispersion theory.** J. A. WASASTJERNA. *Z. physik. Chem.* 101, 193-217(1922).—The at. vol. is the vol. of a sphere having the nucleus as center. The outer electron systems of the atom are situated on the surface of this sphere. When collisions occur between 2 atoms, the min. distance of the nuclei from one another is equal to the sum of the radii of the outer electron system of both atoms. An electrolyte mol. can exist in 2 modifications, one of which consists of uncharged and the other of charged atoms or atomic groups. If a mol. exists in the latter form, it is capable of splitting into ions in a medium having a sufficiently high dielectric const. The 2 modifications exist in equil. This equil. is strongly displaced in one direction in the case of very weak electrolytes and in the other in the case of strong electrolytes. The mols. of amphoteric electrolytes can exist in 3 modifications. The typically strong electrolytes consist almost entirely of polarized mols. On the basis of the preceding assumptions the calcn. of the ionic refractions is possible. This has led to the verification of an important point in the Kossel theory of the structure of the atom. The results of the calcn. show that the external electron layer of an atom of an alkali metal contains only one electron, while that of the alkaline earth metals contains 2 electrons. In the formation of polarized mols. the structure of the ions does not undergo any marked change, and the electron orbits of the ions can be regarded as remaining unchanged. These conclusions can probably be extended to non-polarized mols. and elec. neutral atoms, except in cases where double and triple bonds and rings occur. H. JERMAIN CREIGHTON

**The structure of the atom (according to the recent work of N. Bohr).** LEON BLOCH. *J. phys. radium* 3, 110-24(1922).—A general review of Bohr's new theory of a spatial atom, as found in his 2 letters to Nature (*C. A.* 15, 2381 and 16, 377) and in an address before the Danish Physical Society (*Fysisk Tidsskrift*, Vol. 19). Since then the German translation of this address has been published (*C. A.* 16, 2252). R. T. BIRGE

**An attempt to separate the isotopes of chlorine.** E. B. LUDLAM. *Proc. Cambridge Phil. Soc.* 21, II, 45-51(1922).—HCl at a pressure of a few cm. of Hg was allowed to pass over water or  $\text{NH}_4\text{OH}$ . The density of a small part uncombined was increased less than 1 in 5000, which was within the exptl. error. F. O. A.

**Radium synthesis of carbon compounds from air.** F. H. GLEW. *Nature* 109, 714(1922).—On exposing freshly drawn fibers of quartz or glass in a dark room to the radiation from 1 to 2 mg. of Ra or Meso-Th it was found that the fibers became covered in the course of a week with droplets of a clear white viscid liquid. Further exposure resulted in a change of color and increase in size of the droplets. Microscopic examn. of the final product which became a strongly adherent scaly deposit demonstrated that it was insol. in alc. and  $\text{CHCl}_3$  but sol. in water. On evapp. the water soln. of the deposit a film was formed which carbonized on heating. The results indicate that the action of Ra rays on atm. air is capable of producing C compds. apart from living cells and without the agency of solar radiation. W. H. ROSS

**The small haloes of ytterby.** J. JOLY. *Nature* 109, 711(1922).—A discussion of the possible identity of Y with hibernium, the radioelement assumed to be the origin of the particles that formed the small haloes observed in ytterby mica (*C. A.* 14, 2256). W. H. ROSS

**An attempt to influence the random direction of  $\alpha$ -particle emission.** G. H.

HENDERSON. *Proc. Cambridge Phil. Soc.* 21, II, 56-8(1922).—Neither a magnetic field up to 860 gauss nor an elec. field up to 400 v. can orient the atoms which emit  $\alpha$ -particles.

F. O. A.

The recovery of radium from luminous paint. A. G. FRANCIS. *J. Soc. Chem. Ind.* 41, 94-6T(1922).—Luminous paint is roasted and the radium sep'd. as (Ra, Ba)SO<sub>4</sub>. This is converted into chloride and the radium conc'd. by fractionation. Ra is obtained in a state of about 57% purity and the loss of Ra during recovery is less than 1%.

MARIE FARNSWORTH

A new electrometer with a rigid index for measuring radiations. B. SZILARD. *Compt. rend.* 174, 1618-20(1922).—An electrometer with a rigid needle is described. It has a sensibility of about  $5.7 \times 10^{-13}$  amp. and requires about 350-450 v. It is simple of construction, transportable, requires no initial adjustment and returns automatically to zero.

MARIE FARNSWORTH

The precipitation of uranyl nitrate by sodium hydroxide—radioactivity of the precipitate. PIERRE JOLIBOIS and ROBERT BOSSUET. *Compt. rend.* 174, 1625-8(1922).—A soln. contg.  $1/40$  mol. of UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub> is mixed as rapidly as possible with a soln. of NaOH. The pptn. does not commence until the introduction of an equi-mol. quantity of NaOH. The ppt. is partly colloidal. An examn. of the radio activity of the ppt. shows that the colloidal ppt. and the salt remaining in soln. are richer in U X than the ppt. which first comes down. The oxide of U X is more basic than the oxide of U.

M. F.

The origin of the  $\beta$ -ray spectrum of radioactive substances. L. MEITNER. *Z. Physik* 9, 131-144(1922).—A study is made of the secondary  $\beta$  rays excited in Pb and Pt by the  $\gamma$  rays of Th B. The primary  $\beta$  rays from Th B were completely screened out by a lead tube surrounding the wire upon which Th B and its decompn. products were deposited. The secondary  $\beta$  rays excited at the surface of the lead tube were resolved into a spectrum according to their velocity by a magnetic field. It is shown that the  $\beta$ -ray spectrum of radioactive substances consists of a primary set from the nucleus and a secondary set from the electron rings. A set of primary  $\beta$  rays and also a set of secondary  $\beta$  rays from Th B were found, which had velocity in good accord with velocity calcd. from the Einstein equation for energy changes from one ring to another. The numerical relations between the primary and secondary  $\beta$  rays for Ra D were checked exptly. The purely secondary character of  $\beta$  rays from Ra and radio-Th was demonstrated. A knowledge of the primary  $\beta$  rays gives a direct method for detg. the wave length of the  $\gamma$  rays excited.

D. C. BARDWELL

The relation between  $\beta$  and  $\gamma$  rays. L. MEITNER. *Z. Physik* 9, 145-52(1922); cf. preceding abstract.—In the previous article, the wave length of primary  $\gamma$  rays was calcd. from the knowledge of only one  $\beta$  line. This is an especial case and is not always applicable. The velocity of nuclear  $\beta$  rays from Ra D, measured outside the nucleus, is 40.2% the velocity of light. This may be less than the original velocity inside the nucleus by an amt. accountable in the work done in escaping from the nucleus. Again, the  $\beta$  ray may excite  $\gamma$  rays before it escapes from the nucleus, transmitting all its energy to the  $\gamma$  radiation. The  $\gamma$  rays can then excite secondary  $\beta$  rays in the electron rings. As a working hypothesis to account for the relations between  $\beta$  and  $\gamma$  rays, M. proposes the following: A primary (nuclear)  $\beta$  ray excites  $\gamma$  rays inside the nucleus transmitting all its kinetic energy thereto. The  $\gamma$  ray goes either through the electron rings as  $\gamma$  rays or excites secondary  $\beta$  rays in the electron rings. The characteristic  $\gamma$  rays of a certain kind of atom are formed thereby and they in turn dislodge electrons from the electron rings according to the energy requirements. An explanation is given of the fact that U X emits  $\beta$  rays of 95% of the velocity of light, but gives no noticeable  $\gamma$  rays. The results obtained by Ellis (*C. A.* 16, 2071) on  $\beta$ -ray spectra from Ra B are discussed. The possible stimulation of  $\gamma$  by  $\alpha$  rays is considered and discussed briefly.

D. C. BARDWELL

**The scattering of  $\gamma$  rays from radium C.** JOH. NEUKIRCHEN. *Z. Physik* 6, 106-17(1921).—On passing  $\gamma$  rays through material, part is absorbed, part scattered, and part transmitted. If the ray is monochromatic, the intensity of the rays,  $I_d$ , after penetrating a thickness  $d$  is detd. by 2 const.  $\mu$  and  $\sigma$ , the absorption and scattering coeff. resp., in accordance with the equation  $I_d = I_0 e^{-(\mu + \sigma)d}$ , where  $I_0$  is the initial intensity.  $\mu + \sigma = \mu$ , where  $\mu$  is the total weakening coeff. Kohlrausch (*C. A.* 14, 147) measured  $\mu$  with great accuracy for a no. of substances. The values are used in N's. calcns. N. defines scattered rays as rays from the primary source, thus of the same hardness as the primary rays; not soft like fluorescent rays. The values of  $\sigma$  are detd. by measuring  $I_d$  for various thicknesses of material and detg. the functional change of this intensity with  $d$ . Values of  $\sigma$  for  $H_2O$ , Al, glycerol, and turpentine, resp., are  $0.0383 \pm 0.0005$ ;  $0.0872 \pm 0.0011$ ;  $0.0504 \pm 0.0011$ ;  $0.0306 \pm 0.0004$ . Ishino's value (cf. *C. A.* 11, 1789) for Al is shown to be too high. D. C. BARDWELL.

**Explanation of physical phenomena by the electron theory from the basis of electromagnetic arrangements of electrons in atoms.** EIICHI YAMAZAKI. *J. Chem. Soc. (Japan)* 43, 340-80(1922).—A theoretical paper. After reviewing many important contributions on the subject, Y. adds his own explanations on the fundamental structure of the atom; distribution of electrons in the atoms; decay of Ra and its relationship to the Lewis theory of atomic shape; elec. magnetic field and elec. cond. of metals; factors detg. homogeneous and heterogeneous states in a system; soly. of a compd.; velocity of soln. of crystals and directions of crystals; velocity const. of soln. in various solvents; dielec. const. and elec. dissociation; soln. tension of metals and overvoltage; and solid soln., or mixed crystals. In general, the idea that phys. and chem. phenomena of a substance can be explained on the basis of the changes of electromagnetic arrangements of electrons in atoms is substantiated by various mathematical analyses and tested with available data. S. T.

**Electronic theory of the interior of the atom.** A. D. FOKKER. *Arch. Nierland [jila]* 5, 193-242(1921).—A mathematical paper in which it is shown that the application of the electronic theory to the mutual actions of the electrons inside the atom gives results which are in accordance with exptl. observations. J. C. S.

**A method for determining light velocity from ionization measurements.** H. GREINACHER. *Z. Physik*, 10, 63-8(1922).—Two equations involving elec. methods are given for detg. the velocity of light. One involves the thermionic stream in a vacuum between a glowing wire and a cylinder, and the other the ionization current between two plates in case of surface ionization. MARIE FARNSWORTH

**Low-voltage glows in mercury vapor.** G. STEAD AND E. C. STONER. *Proc. Cambridge Phil. Soc.* 21, II, 66-74(1922).—Glow potentials of Hg were studied under varying conditions in a thermionic tube with the grid close to the filament and with a large space for ionization. The length of the glow depends on the voltage applied. At low pressures and high temps. of the filament a 'second glow' is observed. Hg may ionize at 5.6 v., probably because of successive impacts. The main features of the current phenomena are explained by considering the effect of positive ions on the space charge and the effects of recombination. F. O. A.

**The mass of the electron at slow velocity.** L. T. JONES AND H. O. HOLTE. *Science* 55, 647(1922).—Visual evidence indicates the mass of the electron to be const. up to a velocity of 10,000 v. using an app. (cf. *C. A.* 10, 2170) provided with a heated filament. F. O. A.

**The cathode discharge in a self-contained gas.** W. KOSSEL. *Jahrb. Radioakt. Elektronik*, 18, 326-78(1921).—Methods are described by which the electrons produced even in appreciable amts. at the cathode can be prevented from entering the discharge. Since these electrons are driven back by a few volts their velocity must be small and the



so-called cathode-jump must be due to the erroneous use of a solid voltage sounder. The light phenomena in a discharge through He are shown to be due to electron movements.

F. O. A.

**A new quantum-theory explanation of the Voigt theory of the anomalous Zeeman effect of the D-line type.** A. SOMMERFELD. *Z. Physik* 8, 257-72(1922).—Voigt (*C. A.* 7, 3268) has set up vibration equations for the Zeeman effect of the sodium D lines, which give not only the anomalous effect for weak fields, but the transformation into the normal effect for strong fields (Paschen-Back effect), agreeing with expt. at all stages of the transition. The Voigt theory of the anomalous Zeeman effect thus corresponds to the Lorentz theory for the normal effect, giving an adequate expression of the facts in terms of the vibration theory. S. has shown (*Nach. kgl. Ges. Wiss. Göttingen Math. physik. Klasse* 1914) how the equations for the absorption process (inverse Zeeman effect), used by Voigt, may be simplified by using the emission process. In the present paper it is shown how these equations may be expressed in terms of the quantum theory. The first portion of the paper is taken up by a comprehensive summary of the Voigt theory, which is based essentially on the coupling, in the presence of an external magnetic field, of several electrons bound in a quasi-elastic manner. In the latter portion, the anomalous Zeeman effect is systematized in terms of the quantum theory, and there is obtained an equation which represents the exptl. facts, not only for the principal series doublets (D lines) but also for the more complicated case of the diffuse series triplet (two main lines and one satellite). Full diagrams are given for these two cases, showing the transformation from the anomalous to the normal effect, as the magnetic field strengthens. The quantum theory, as here used, is based on the arbitrarily introduced third quant number—the "inner" quant number, which is in some way connected with the magnetic field of the atom. A selective principle for the inner quant number, similar to that proved for the azimuth quant number, together with the usual assumptions of the Bohr atom, then leads directly to the desired result.

R. T. BIRGE

**The quantum theory of line structure and the anomalous Zeeman effect.** W. HEISENBERG. *Z. Physik* 8, 273-97(1922).—Recent exptl. work by Back and Paschen, and theoretical work by Landé and Sommerfeld, have resulted in completely systematizing all known forms of the anomalous (complex) Zeeman effect, in the form of certain relatively simple equations. These equations, based on the quantum theory of line spectra, involve an arbitrarily introduced "inner" quant number. Changing values of this quantity are responsible also for the doublet and triplet character of spectral series, a matter intimately connected with the anomalous Zeeman effect. In the case of doublet series the theory has indicated quantitatively the transition from weak to strong fields (see preceding abstract). In the present paper the inner quant number is given a physical explanation, and the entire anomalous Zeeman effect, together with the matter of spectral line complexity (doublet and triplet series) given a possible interpretation in terms of actual at. structure. Doublet series occur in elements with odd valence, triplets in those with even valence. The simplest explanation seems to lie in the assumption that one electron, loosely coupled, plays a special role in the case of doublets, and two such electrons in the case of triplets. When the single valence electron of the first type of atom is in its normal orbit, the total angular momentum of the atom is, by the Bohr theory, one quantum-unit. The author now assumes that this momentum is, in the mean, divided equally between the electron and the remainder of the atom (called the "atom body"), thus giving the atom body one-half unit, and that when the electron is in other orbits, and has the varying momentum previously assigned by theory to these orbits, the atom body always has its one-half unit. But in the case of other orbital positions, a quantelation of the momentum indicates that the electron may revolve in

either of two opposite directions, relative to the momentum axis of the atom body. This results in two values of the geometric sum of the angular momentum of the entire atom, and the values thus obtained are identical with those previously assigned, arbitrarily to the inner quant number. Thus the doublet character of spectral lines, such as the Na lines, is interpreted as due to the two possible directions of rotation of the valence electron, in orbits other than the stable orbit. Furthermore, the possession of angular momentum by the atom body indicates that it has a magnetic moment, and this constitutes the essential condition for an anomalous Zeeman effect, as well as for a complex line structure. When an external magnetic field is applied, the atom body sets itself parallel to the resultant of this external field  $H$ , and the internal magnetic field  $H_i$ , produced by the revolving valency electron. The angle between  $H$  and  $H_i$  is limited, by "spatial" quantelation, to a series of discrete values, a fact which later appears as the basis of the series of equally spaced components occurring in all known types of the anomalous Zeeman effect. An expression for the total at. energy, including the magnetic energy of the valence electron and of the atom body, coupled in the manner postulated, leads directly to the equation which has already been found to express all the known exptl. facts of the anomalous Zeeman effect, in the case of doublet series, as well as to predict the effect in the case of all other types of doublet series not yet investigated. The equation gives incidentally the actual doublet sepn., for no magnetic field, in terms of  $H_i$ . Only in the case of Li can  $H_i$  be closely evaluated, and here the results check quantitatively with expt. The complete Paschen-Back effect is due to the fact that when  $H$  becomes much larger than  $H_i$ , the axis of the atom body sets itself practically parallel to the axis of  $H$ , regardless of the direction of  $H_i$ . The last portion of the paper deals with the elements having two valence electrons. Such elements exhibit single line series possessing a normal Zeeman effect, as well as triplet series having an anomalous effect. The assumption here is that each valence electron, in the stable condition, shares its one unit of angular momentum with the atom body. Two general conditions are now possible. (1) The two electrons (an "inner" and an "outer" electron) are revolving in the same direction, and the total momentum of the atom body is one-half plus one-half units. Reasoning similar to that for the doublet series then leads to an expression for the anomalous Zeeman effect shown exptly. by triplet series. The expression incidentally includes the ratio of the two frequency intervals of a triplet, with no magnetic field, and the results are in general agreement with expt. (2) The two electrons revolve in opposite directions and the momentum of the atom body is zero. Hence it has no magnetic moment, and this condition leads immediately to single spectral lines exhibiting a normal Zeeman effect. Additional complications introduced by the presence of two valence electrons, instead of one, prevent such a complete physical interpretation of this case as was possible for the doublet series. In particular, the inner quant number now has no such simple physical interpretation as in the former case.

R. T. BIRGE

Calculation of the constant  $c_2$  of Planck's formula and determination from Planck's isochrome of the average wave length of residual rays. MICHEL GERHARD. *Z. Physik* 9, 285-99.—The value of  $c_2$  in the formula  $E = (C_1/\lambda^5) [1/(e^{c_2/\lambda T} - 1)]$  is calcd. to be 14,270. The necessary exptl. data are taken from the recent work of Rubens and Michel which completely verifies Planck's equation. Wave lengths from  $4 \mu$  to  $16 \mu$  were used. Comparison of the monochromatic energies,  $E_2$  and  $E_1$ , at two temps.,  $T_2$  and  $T_1$ , where  $T_2 = 2T_1$ , gives the simple formula  $c_2 = \lambda T_2 \ln [(E_2/E_1) - 1]$ . The errors are discussed critically and the value of  $c_2$  is compared with those of other workers. The residual rays for fluorite, aragonite, NaCl, NH<sub>4</sub>Br, KCl were detd. exptly. Use was made of a graph where  $(E_2 - E_1)/(E_2 - E_1)$  was plotted against  $\lambda$ ,  $E_2$  being calcd. from Planck's equation at  $405^\circ$ ,  $E_1$  at  $17^\circ$  and  $E_1$  at the temp. of liquid

air. The results check very closely with the residual rays as detd. by other workers with different methods. The agreement serves to establish the correctness of Planck's formula to  $65 \mu$ .

FARRINGTON DANIELS

**The photoelectric action of alkaline earth sulfides.** KARL GÖGGELE. *Ann. Physik* **67**, 301-19(1922).—The purpose of this work was to det. the spectral distribution of photoelec. action causing phosphorescence excitation. Advantage was taken of the earlier experiences of Lenard and Saeland (*C. A.* **3**, 1616) and certain refinements in app. and technic were made. Unlike the metals, the phosphorescent materials increase in photoelec. action less rapidly with increasing light intensity, *e. g.*, two intensities in the ratio 1 : 3.4 give electrometer deflection in the ratio 1 : 2.1. This failure of proportionality is explained by the poor elec. cond. Measurements of the spectral photoelec. sensitivity were made under 3 conditions, first for the exciting light only, then for simultaneous extinction with red ( $6110$  to  $1300 \mu\mu$ ) and finally for extinction with green light ( $520$  to  $570 \mu$ ). Normal and selective photoelec. actions are superposed and the total has the same spectral distribution as the absorption which furnishes the energy for excitation. This proves that the excitations are caused by the loss of electrons, and that these electrons come from the active metals (Bi, Sr) is shown by diminished action when the metal content is reduced.

W. F. MEGGERS

**The physics of the X-ray tube.** G. W. C. KAYE. *J. Röntgen Soc.* **18**, 15-26 (1922).—A general discussion of the physics of the X-ray tube for practical röntgenologists. A discussion of the various types of high-potential current available is followed by the relative characteristics of gas and Coolidge tubes, the quantum limit or short wave length limit in relation to the voltage applied, the character of the spectra, the factors controlling the output, and the effect of filtering.

F. P. PHELPS

**Resolution of the K $\alpha$  doublet in the powder method of X-ray crystal analysis.** L. W. MCKEEHAN. *J. Franklin Inst.* **194**, 87-92(1922).—The following conclusions are reached. "Double spots due to reflection of 2 nearly equal wave lengths by the same crystal may be of 2 kinds. (1) Fine parallel lines are due to reflection of rays from different parts of the source by a very small crystal. The sepn. of such lines depends only upon the difference in wave length, the mean wave length, and the mean of the observed angles of reflection. They are excellent objects under the microscope and give an accurate method for detg. small differences in wave length. (2) Projected images of the whole source are due to reflection of rays from each point of the source at different points in the crystal. The sepn. of such images depends upon the difference in wave length, the mean wave length, the mean of the observed angles of reflection and upon the ratio of the whole path length of the rays to the path length after reflection. In the usual arrangement spots of the second kind are about twice as far apart as spots of the first kind." Duane's value for the wave-length difference of the K $\alpha$  doublet of Mo was checked by measurements on spots of the first kind.

J. S. H.

**Use of Röntgen rays in the investigation of minerals in powder form.** G. AMINOFF. *Geol. Förh.* **44**, 197-201(1922).—From Bragg's equation  $2d \sin \phi = \gamma\lambda$  for the distance between equivalent atom faces parallel with a given face  $hkl$  A. develops the equation  $\sin^2 \phi_1 = \lambda^2/4a^2(1^2 + 0^2 + 0^2) = \lambda^2/4a^2$  as the first of a series of equations for  $a$  the distance between equiv. atom faces of a cubic crystal. He shows also how other series of equations can be developed for more complicated crystals.

W. SÖGERBLOM

**Ten years of X-ray crystal analysis.** A. E. H. TUTTON. *Nature* **110**, 47-8(1922).—A review.

W. H. ROSS

**The fluorescence of mercury vapor excited by Röntgen rays.** J. STEPH. VAN DER LINGEN. *Z. Physik* **10**, 38-40(1922).—Hg vapor fluoresces at the same temp. when excited by a Ca arc or Röntgen rays. Röntgen rays are not so easily absorbed. The fluorescence spectrum of a thin layer of vapor excited by soft rays shows 2 bands

and 5 lines. With hard rays 1 band and 2 lines are visible. With the possible exception of the band in the visible spectrum there is no similarity between the spectrum excited by Röntgen rays and that excited by ultra-violet light of wave length between 1860 and 2500 Å.

MARIE FARNSWORTH

**The structural decomposition and rebuilding of gadolinites in Röntgen light.** HANS KUSTNER. *Z. Physik* 10, 41-3(1922).—A natural anisotropic crystal of gadolinite ( $\text{SiO}_4$ )<sub>2</sub>Y<sub>2</sub>B<sub>2</sub>Fe, a natural isotropic crystal and an anisotropic crystal formed by heating an isotropic crystal to 1000° were examd. by the Röntgen ray method of Debye and Scherrer. The spectral lines of the 2 anisotropic samples agreed but no lines appeared with the isotropic sample, thus showing that this crystal is truly isotropic and no colloidal or sub-colloidal anisotropic crystals are present.

MARIE FARNSWORTH

**Source of light giving a continuous spectrum in the ultraviolet.** W. H. FULWELLER AND JAMES BARNES. *J. Frank. Inst.* 194, S3-6(1922).—Light is obtained from an arc between two electrodes of W which are immersed in running water. The electrodes are rods of W, 3.5 mm. in diameter, mounted in brass rods which are inserted in rubber stoppers. W is superior to Al, Fe, Ni, C, Mo, and brass, since it gives more light in the shorter wave lengths, and requires very much less adjustment.

J. S. H.

**Permanganate absorption spectrum: Claim for priority: Formula for calculating the uranium spectrum.** JAMES MOIR. *Trans. Roy. Soc. S. Africa* 10, 33-4(1921).—M. claims priority for a formula giving the wave lengths of the bands of permanganates (*C. A.* 15, 1713) over Adinolfi (*C. A.* 15, 1856). The formulas put forward by the two authors differ in form, but reduce to the same expression. From the formula for the absorption spectrum of uranyl salts,  $n = 1/\lambda = 2113 + 66N$ , where  $N = 0, 1, 2, 3$ , or 4 (*loc. cit.*), it is now shown that the bands of non-ionized solid salts may be calculated. Thus the bands of autunite are given by dividing the figures calculated by the above formula by the sixth root of the ratio of the molecular weight of the salt to that of  $\text{UO}_2^{++}$ . In this case the observed bands are  $\lambda\lambda$  1945, 2000, 2062, 2128, and 2190, while the bands calculated by the formula  $n = 1/\lambda = (2113 + 66N)/\sqrt[6]{911/2 \times 270} = 1937 + 60.5N$  are  $\lambda\lambda$  1937, 1997, 2058, 2118, and 2179.

J. C. S.

**Absorption of light by solutions.** HARALD LUNELUND. *Öfvers Finska Vet.-Soc.* 59, No. 21, 21 pp.(1916-17).—In working with aq. solns. of "brilliant safranin," "tartrazine," "crystal-ponceau," and "rose Bengal" with and without addn. of  $\text{H}_2\text{SO}_4$ , it was shown that the extinction coeff.,  $\epsilon$ , calcd. from the formula  $I' = I \cdot 10^{-\epsilon d}$ , agrees with Beer's law, according to which the extinction coeff. is proportional to the concn. By using the König-Martens spectral photometer, it is shown that in aq. solns. of safranin a marked max. absorption occurs for  $\lambda 519\text{m}\mu$ . By addn. of  $\text{H}_2\text{SO}_4$  the color changes to green through violet, and the absorption max. changes to  $\lambda 622\text{m}\mu$ .

J. C. S.

**Optical properties of solutions. A theory of the structure of the molecules of electrolytes.** J. A. WASASTJERNA. *Acta soc. sci. Fennicae* 50, No. 2, 129pp.(1920).—The ns. and ds. of aq. solns. of a no. of org. salts, NaCl, KCl, and oxalic acid were detd. for 2 different temps. and for 3 different wave lengths at each temp. From the results obtained certain conclusions were drawn as to the influence of dissoc. on the optical properties of electrolytes. The number of valency electrons in each atom may be directly calcd. from Eisenlohr's at. refraction const. and the results are in agreement with Drude's valency theory. A new interpretation of the Lorenz-Planck dispersion formula is given leading to a working hypothesis whereby the selective photoelec. effect can be calcd. as well as, in certain cases, the alteration in refraction and dispersion due to ionization. It is shown that the temp. coeff. of mol. refraction for dissolved salts is always negative by the Newton-Laplace formula, variably positive and negative by the Gladstone-Dale formula, and negative by the Lorentz-Lorenz formula. It is further shown that the additive character of sp.-refractive power is satisfied by the Gladstone-Dale formula.

For the detn. of the mol. refraction of dissolved salts, strong solns. should be used and the values extrapolated for 100%. The optical properties of salt solns. can be simply explained by assuming that the ions occur ready formed in the mols. of strong electrolytes while the mols. of weak electrolytes cannot be thus polarized. J. C. S.

The centers and spatial distribution of light emitted from metals, especially in the electric arc. A. HÖRNL. *Jahrb. Radioakt. Elektronik* 18, 297-326(1921).—Investigations of the spatial distribution of ultraviolet light from elec. metallic arcs of Li, Na, K, Ca, Ba, Cu, Zn, Al, Mg and Hg, an exhaustive study of Hg arcs in vacuum, direct comparison of the spatial distribution of the light emitted from different elements, and investigations of the temps. in elec. arcs, demonstrate the truth of the Lenard principle that main spectral series are due to neutral atoms while the subordinate series are due to positively charged atoms. A comprehensive account of previous work is given. F. O. A.

The spectrum of hydrogen. T. R. MERTON and S. BARRATT. *Trans. Roy. Soc. (London)* 222A, 369-400(1922).—Modern theoretical investigations have explained the Balmer spectrum of H but satisfactory explanation of the many-lined or secondary spectrum required that the data relating to wave lengths should be more accurate and complete. The conditions are discussed under which the Balmer series and the secondary spectrum of H are produced. The spectrum was photographed with a diffraction grating of 120 cm. radius and 20000 lines per in. Between the limits 6540.53 and 3368.47 Å about 1200 lines were measured. It was found possible to classify the lines into different physically related groups under different conditions depending on the pressure of the gas in the discharge tube, the elec. conditions of excitation and the presence of He. These methods of classifying the lines have been compared with the results obtained by other investigators relating to the Stark and Zeeman effects and with the regularities observed by Fulcher. These different methods of classification are related to one another, but there are numerous exceptions to any broad generalization. A comparison of the wave lengths in the secondary spectrum with the Fraunhofer and Sunspot spectrum gives no evidence of the presence of secondary H in the sun. A new method of measuring the widths of spectrum lines was developed with an attempt to avoid the personal errors inherent in methods depending on estimates of interference visibility. The theory of the method based upon photographs of lines in double-order and single-order position of an echelon spectrograph is given. Half-widths of lines in the secondary spectrum of H are observed as 0.034 Å, which is in agreement with a mol. origin since the values calcd. for the mol. av. 0.033 Å, while for the atom it would be 0.047 Å. Expts. were made which appear to show that when elec. discharges are passed through spectrum tubes, a partial sepn. of the gases takes place, and this may explain the enhancement of the Balmer series in the central portions of the capillary of a H tube not absolutely free from impurities. W. F. MEGGERS

Fine structure of the hydrogen red line and its Zeeman effect. OTTO OLDENBERG. *Ann. Physik* 67, 253-77(1922).—The Sommerfeld quantum theory of fine structure and of Zeeman effect is tested by observations on the red line of H, a 33-plate echelon grating having a resolving power of 300,000 being used. To explain the discrepancies among previous results on the fine structure of H $\alpha$  the sources of error arising in measurements of close diffuse doublets are discussed in detail. The new result obtained without magnetic field gives a doublet sepn. of  $0.140 \pm 0.008$  Å. for H $\alpha$  while the value derived from theoretical considerations is 0.141 Å. Investigations of the Zeeman effect show for the  $p$ -components that the doublet components are not appreciably displaced in weak magnetic fields (3500 gauss) but are somewhat broadened and thus appear to be closer. For stronger fields (18000 gauss) the components coalesce to form one line whose width is less than the sum of the original components. For small fields the Zeeman resolution

of the s-components is normal; for stronger fields an obliteration of the fine structure is again observed. These observations indicate that for weak fields each component in the fine structure shows normal Zeeman effect as predicted by Sommerfeld's theory. The possibility of an unexpected Stark effect is tested but it is concluded that neither the increased fall of potential in the tube nor the heat motion of the atoms across the magnetic field can give rise to any Stark effect.

W. F. MEGGERS

**The absorption of mercury vapor.** J. FRANK AND W. GROTRIAN. *Z. tech. Physik* 3, 194-7 (1922).—To test the theory that the absorption bands of Hg vapor are due to diatomic mols. the absorption of the band at 2540 Å. was observed in superheated vapor. A sample satd. at 200°, pressure 20 mm., was observed at temps. up to 1200°. The strength of the band was found to decrease with increasing temp. A second sample, satd. at 240°, 35 mm. pressure, showed greater absorption at low temps., but became nearly transparent at 1200°. This behavior confirms the belief that the band is due to the mol., which is dissociated at high temps. From the rate of variation of absorption with temp. it is concluded that the work required for dissociation is of the order of one large cal. The no. of mols. involved in the absorption is remarkably small, even at the lowest temps., where the partial pressure of mols. is less than  $10^{-4}$  mm. K. BURNS

**Infra-red characteristic frequencies of the silicates.** CLEMENS SCHAEFER AND MARTHA SCHUBERT. *Z. tech. Physik* 3, 201-4 (1922).—Since crystals contg. CO<sub>2</sub> and similar groups show selective reflection which is characteristic of the group, and which varies in a simple manner with the type of crystal, an analogous phenomenon was sought in the case of the silicates. The reflecting power of 13 silicates was observed throughout the range 1 to 20μ, and 12 of these showed maxima near 10μ and 18μ. These maxima were complicated, varying greatly from one substance to another, and could not be correlated with the crystal structure in the simple manner noted in connection with other groups such as CO<sub>2</sub>, ClO<sub>2</sub>, etc. One specimen, analcite, lacked the max. of greater wave length. Two specimens contg. the group SiO<sub>2</sub> showed no particular similarity in their reflection curves.

K. BURNS

**The spectra of sparks in water.** LEON BLOCH AND EUGENE BLOCH. *Compt. rend.* 174, 1456-7 (1922).—The spectra of the oscillating spark in water was observed for 15 metals. The continuous spectrum was found to be about the same with all metals. It grew fainter as the number of oscillations was decreased. Both the continuous spectrum and the ordinary spark lines were emitted by the central portion of the spark, while the envelope gave rise to the arc spectrum in the form of an absorption spectrum. The flame lines are particularly strong. This source therefore furnishes a ready means of distinguishing between the arc and spark lines of an element, and facilitates the discovery of related lines. The authors, taking advantage of this feature, found 4 related doublets in the spectrum of tin and a new frequency relation in the spectrum of Cu.

K. BURNS

**The efficiency of the Bucky diaphragm principle.** R. B. WILSEY. *J. Röntgen Soc.* 13, 77-89 (1922).—With a 6-in. depth of water as the scattering material the efficiency of the Bucky diaphragm in removing scattered radiation has been measured for a variety of widths and depths of slit. The intensity of diffuse radiation is a function of the ratio of slit width to slit depth, not depending upon the actual size of the slit. The diaphragm was found to be highly efficient, it being easily possible to remove more than 80% of the scattered radiation. The definition obtainable depends chiefly on the distance between the subject radiographed and the film; by making this sufficiently small considerable improvement in definition can be attained. It can be used with advantage in radiographing thicknesses as small as four inches. The crossed grid of the original Bucky-type gives very little advantage over the Potter type of grid with the same depth of slit.

F. P. PHELPS

Remarks on the transfer of energy in photochemical processes. A. BYK. *Z. wiss. Phot.* 21, 197-200(1922).—This is a comment on the failure even of the quantum theory to explain sufficiently the relation between luminous energy and photochem. action.

G. R. FONDA

Pleochroic haloes (GUDDEN) 8. Ultra-violet absorption spectra and optical rotation of the proteins of the blood sera (LEWIS) 11A.

CHWOLSON, O. D.: *Lehrbuch der Physik*. Vol. II. Sect. 2: *Die Lehre von der strahlenden Energie*. 2nd Revised and enlarged ed. Edited by G. Schmidt. Brunswick: Friedr. Vieweg & Son. M 80 bound M 100.

HICKS, W. M.: *Analysis of Spectra*. Cambridge: at the University Press. 326 pp. 35s. Reviewed in *Rev. Sci.* 60, 424(1922).

Coating metals to render them photosensitive to passage of electric current. H. L. FALK. U. S. 1,424,088, July 25. A compn. formed of "platinum-barium-cyanide of potassium" crystals, crude S, Na tungstate, CaCl<sub>2</sub> and Se crystals is used for coating a Pt wire or other metal in order to adapt it for use in reproduction of sound waves by the action of a ray of light.

Treating substances with radium emanations. J. A. HODGSON, R. H. WALKER and J. H. R. MARSHALL. *Brit.* 178,032, June 13, 1921. Substances for human use or for industrial purposes such as medicaments, soaps, oils, motor spirit, dyes, scents, liquids for scouring wool or fabrics, feed-water for boilers, and raw materials in general are subjected to the action of rays from radium or other radioactive substances and compds. by enclosing the latter in a primary glass container surrounded by a larger, secondary glass tube, the whole being supported by a holder in the form of a metal casing or a number of casings. A suitable construction is specified.

Observing ionization effects in gases. T. SHIMIZU. *Brit.* 177,353, Feb. 7, 1921. An app. is specified by means of which the tracks of an ionizing agent passing through a gas are rendered visible by condensation of satd. vapor upon the ions produced by the agent the supersatn. being produced by expansion of the previously satd. gas. The ionizing agent may consist either of the emanations from a radioactive substance, or of X-rays.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

High pressure mercury arc rectifiers and rotary converters. ANON. *Electrician* 89, 72(1922).—A short note referring to the new Brown-Boveri Hg arc rectifiers. One of these illustrated is rated at 900 amp. d. c. up to 750 v. With these Hg arc rectifiers it is possible to use much smaller automatically operated sets placed in cheaply constructed substations along an elec. railway as compared with the corresponding large size rotary converters. The saving in Cu alone is considerable.

C. G. F.

Electron tube amplifier for amplifying direct current. H. A. SNOW. *J. Optical Soc. Am. Rev. Sci. Instruments* 6, 186-92(1922).—Two resistance coupled amplifier circuits were constructed to amplify both a d. c. and an a. c. of 10 milliamps. to 110 200 milliamps magnitude, and tests made to det. the amplification for best adjustment of the circuit constants. Details are given.

D. MACRAE

Experiments with alternating current in direct current electrolysis. W. B. JONES. *Proc. Am. Electrochem. Soc.*, Preprint, May 1, 1922.—By superimposing a. c. on d. c. in

electrolysis, a decrease in potential is obtained. This is manifested by measurements of overvoltage and the character of products resulting. Overvoltage is understood to be the excess potential required to discharge an ion at the electrode above the potential of a reversible electrode in equil. with the same ion. The purpose of the investigation was: (1) to study the cathode overvoltage of Pb electrodes in  $H_2SO_4$  during d. c. electrolysis by superimposing a. c. under varying conditions of current and (2) to study cathodic overvoltage, an intermittent d. c. being used. Description and drawings of the elec. arrangement of app. are given with tables and curves of results and 2 theories are offered as explaining the phenomena observed. The overvoltage of Pb is found to be about 1.1 v. with d. c. alone. This overvoltage is a max. and exists only while the current is flowing. On stopping the current, the back e. m. f. falls from its overvoltage value at the rate of five v. per sec. to 0.05 v. It is concluded that cathodic overvoltage of Pb is caused by the formation of higher hydrides which are increasingly unstable. L. D. V.

Temperature of an electrically heated filament. C. SNOW. *Phys. Rev.* 18, 153-60 (1921); *Science Abstracts* 25A, 235-6. H. G.

Present status of electric and magnetic units (DELLINGER) 2. Electrical insulating papers (ANON.) 23.

Elektrizität im Eisenhüttenwerk. Berlin: Allgemeine Electricitäts-Ges. 240 pp.

Electric dust precipitation. METALLBANK UND METALLURGISCHE GES. AKT.-GES. Brit. 177,117, Sept. 23, 1921. Furnace gases are cooled to the dew point or below, whereby they are de-ionized, and are heated again in such a way as to prevent ionization by flames, etc. The gases then enter an elec. precipitator, in which dry deposits are thus obtained.

Electric oven. J. D. HAYNSWORTH. U. S. 1,422,857, July 18.

Electrical resistance heater. R. W. REYNOLDS. U. S. 1,422,130, July 11. An insulating support is coated with a resistance heating film containing powdered graphite and a water-washed-ppt. formed from Na silicate soln. and  $Al_2(SO_4)_3$ .

Electric smelting of ores. COBB ELECTRO REDUCTION CORPORATION OF CANADA. Brit. 176,819, Sept. 13, 1920. Complex metallic ores are smelted in a bath of high-resistance materials through which a main direct current of electricity is passed, a secondary direct current, automatically controlled, being passed in different directions through the fused mass as the main current varies. A suitable construction is specified.

Calcium carbide. W. B. ROGATZ. U. S. 1,422,135, July 11. In producing  $CaC_2$  in an elec. furnace, the material constituting the furnace charge is fed through the wall and side crust of the furnace above the molten material in the furnace and below the top crust.

Electrolytic extraction of metals. H. BARDT. U. S. 1,423,069, July 18. Cu is recovered from ores, mat. or Cu-bearing wastes, or alloys by treating the material with a soln. contg.  $H_2SO_4$  and  $HNO_3$  and a catalyzer such as a V, Os, Ce or Mn compd. under pressure generated by electrolyzing the soln. in a closed chamber.

Electrolytic apparatus for decomposing sodium chloride solutions. K. E. STUART. U. S. 1,423,584, July 25. The pat. relates to connections for passing cleaning fluid such as steam through the pipe or orifice through which brine is fed to the cell.

Electrodes for electrolytic processes. H. BARDT. U. S. 1,423,071, July 18.

Powdered lead. KENZŌ MAJIMA. Japn. 39,576, Aug. 18, 1921.  $Pb(NO_3)_2$  is electrolyzed with 3 v. Finely divided Pb around the Pb cathode is collected, washed and further powdered by a ball mill in the presence of  $CO_2$  or other inactive gases. The yield is about 3.75 g. per amp. hr.



**Alkali chromates.** A. J. B. JOUVE, A. HELBRONNER AND SOC. HYDRO-ELECTRIQUES ET MÉTALLURGIQUE DU PALAIS. Brit. 177,174, March 17, 1922. Alkali chromates are obtained by electrolysis of alkali carbonate soln. with anodes of ferrochrome, and without a diaphragm. The chromate may be converted into dichromate by continued electrolysis after complete conversion of the carbonate. Concd. solns. are preferably employed, so that the resulting chromate or dichromate soln. is near the crystg. point. To obtain neutral chromate, dichromate may be first formed and excess of alkali carbonate then added.  $\text{Fe}_2\text{O}_3$  is formed as a ppt. and is removed from time to time by agitation and filtration of the liquid or by centrifugal sepn. The anodes may alternatively consist of chromite and tar heated below fusion partially to reduce the oxide of chromium. The cathodes may be of Pb. Ferrochrome anodes should contain not less than 40-45% of Cr. A current density of some hundreds of amp. per sq. m. is employed so as to heat the electrolyte. Alternating current may be used. The electrolysis may be carried out in a series of baths between which the electrolyte circulates.

**Electroplating.** N. V. PARK. U. S. 1,423,815, July 25. Air is injected into an electrolyte in order to agitate it and assist in loosening metal from the anode for transfer to the cathode.

**Electrofinning.** L. SCHULTE. U. S. 1,423,686, July 25. Dil.  $\text{H}_2\text{F}$  is added to a soln. of KOH in  $\text{H}_2\text{O}$  until an acid reaction is obtained and Sn is electrolytically dissolved in a dil. soln. thus prepd. for use as an electrolyte in coating sheet Cu or other metal.

**Electroplating with cadmium.** UDYLINE PROCESS CO. Brit. 178,422, March 11, 1922. Articles of Fe, steel, or other metal are provided with a rust-resisting coating of Cd by electrolysis of a basic or neutral soln. of the cyanide with an anode of graphite, C, or other insol. and non-polarizing material. The articles are then washed and baked for some hrs. at a temp. of  $150^\circ$  to  $200^\circ$ , or up to  $250^\circ$  if embedded in  $\text{Ca}(\text{OH})_2$ . The electrolyte may contain from 1.25-15% of Cd and from 1-25% of NaCN. It is preferably prepd. by first dissolving 25 g. of metallic Cd in HCl to form a neutral soln. or a corresponding quantity of the sulfate or Cl in  $\text{H}_2\text{O}$ . If  $\text{HNO}_3$  is used to dissolve the Cd, the soln. is evapd. to dryness with HCl. A soln. of NaOH or KOH is added to the neutral soln. until all the Cd is pptd. and the soln. is red to phenolphthalein. NaCN or KCN is then added until the  $\text{Cd}(\text{OH})_2$  is redissolved. A slight excess of free cyanide is allowable. The soln. is then dild. to 1 l. The strength of the soln. is maintained const. by adding  $\text{Cd}(\text{OH})_2$ . With an electrolyte contg. 10.5% of Cd current densities of 25 to 290 amp. per sq. ft. may be used. The articles may be pickled in single or mixed acids, washed, and scratch-brushed, before plating.

**Electrical insulating composition.** F. T. LAHEY. U. S. 1,422,720, July 11. Cotton or other vegetable fiber is treated with a dil. alkali soln. such as NaOH in the presence of a vulcanizable oil and rubber, a vulcanizing agent such as S is added and the mixt. is heated to effect pptn. of the oil within the structure of the fiber and vulcanization of the material to render it suitable for making storage battery containers.

**Storage battery separator plates.** G. E. BUCK. U. S. 1,423,815, July 18.

**Electric discharge lamps.** PATENT- TREUHAND-GES FÜR ELEKTRISCHE GLÜH-LAMPEN. Brit. 177,811, April 3, 1922. A glow discharge lamp contains Ne and more than 30% He. The mixt. is preferably 25% Ne and 75% He at a pressure of 10 mm. of Hg.

**Positive electrode for luminous arc lamps.** C. A. B. HALVORSON, JR. U. S. 1,422,439, July 11. The electrode stem is anchored in an Fe shell by a cold compacted Cu core.

**Inclosed electric arc lamp.** E. FRIEDRICH. U. S. 1,422,553, July 11. A sealed lamp contg. electrodes of W or other refractory metal is provided with a halogen salt such as Al or Tl chloride to give a luminous spectrum of desired color.

Leading-in wires for incandescent electric lamps. F. HOGE. U. S. 1,422,443, July 11. Leading-in wires of incandescent elec. lamps of Fe or steel or other relatively cheap metal are coated with W 8 and fused glass 1 part.

Electric ozone generator. H. B. HARTMAN. U. S. 1,423,858, July 25.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

New volumetric method as applied to certain problems in inorganic chemistry. PAUL DUTOIT AND ED. GROBET. *J. chim. phys.* 19, 324-7(1922).—From a buret, which is thermally isolated, a soln. is delivered into a Dewar flask contg. the other soln. for comparison. A thermometer graduated to 0.01° is read during the titration and the temp. is plotted against the buret readings. Straight line curves are found with sharp breaks at reaction ends. Such diagrams show breaks when  $H_2SO_4$  is half neutralized by NaOH and also when the normal sulfate is formed. The different stages of neutralization of  $H_3PO_4$  by NaOH are clearly indicated; addn. of  $HNO_3$  to  $Na_4PO_4$  gives curves with breaks at each step; addn. of NaOH to  $Zn(NO_3)_2$  gives breaks corresponding to the formation of  $Zn.NO_3.OH$  and of  $Zn(OH)_2$  and of  $Zn(ONa)_2$ . Similarly for  $Pb(NO_3)_2$ , the breaks occur at  $PbO.Pb(NO_3)_2$ , at  $Pb.NO_3.OH$  at  $Pb(OH)_2$ , and at  $PbOH.ONa$ . With  $Mg(NO_3)_2$ , there are 3 breaks at  $Mg.NO_3.OH$ , at  $Mg(OH)_2$  and at a third point at which the formula of the compd. is in doubt. The salts of Cu, Co and Ni give evidence of a succession of complexes as  $NH_3$  is added. This method furnishes evidence of compds. not indicated by other methods.

JAMES M. BELL

Reactions of caustic soda with aluminium salts. EDOUARD GROBET. *J. chim. phys.* 19, 331-5(1922).—In an unpublished thesis of 1916, Korsakoff has investigated the behavior of Al compds. on addn. of NaOH by observing the conductance of the solns. during the progress of the reaction. This study, which was limited to dil. solns. of Al salts, gave the following main conclusions:  $Al(OH)_3$  is never pptd. pure but is always contaminated by aluminate; and aluminate is produced when 4 mols. NaOH are present to 1 atom of Al; the aluminate  $Al(ONa)_3$  is formed by pptg. alum solns. This work is now repeated using also concd. solns. and also employing the temp. method described in the preceding abstr. The two methods show breaks at similar stages of the titration. The following results are indicated. Addn. of NaOH to dil. solns. of  $Al(NO_3)_3$  yields successively  $Al(OH)_3$ ,  $Al(OONa)$  and  $Al(ONa)_3$ ; addn. of NaOH to dil. solns. of  $AlCl_3$ , of  $Al_2(SO_4)_3$  and of potash alum yields successively  $Al(OH)_3$ ,  $Al(ONa)_3$ ,  $Al(OH)_3$  and  $Al(ONa)_3$ ; addn. of NaOH to concd. solns. of  $Al(NO_3)_3$ , of  $AlCl_3$  and of  $Al_2(SO_4)_3$  yields successively  $AlX_3.Al(OH)_3$ , where X indicates Cl,  $NO_3$  or  $1/2SO_4$ , then  $Al(OH)_3$ ,  $Al(OONa)$  and finally  $Al(ONa)_3$ ; addn. of NaOH to concd. solns. of potash alum yields successively  $Al_2(SO_4)_3.2Al(OH)_3$ , then  $Al(OH)_3$ , then  $Al(OH)_3.Al(ONa)_3$  and finally  $Al(ONa)_3$ .

JAMES M. BELL

Yttrium. JOHN MISSENDEN. *Chem. News* 125, 28-30(1922).—The occurrence, properties and prepn. of Y are outlined. Its salts are listed and their similarity to those of Zr is pointed out.

W. H. BOYNTON

X-ray investigations of the trioxides of tungsten and molybdenum and their hydrates. H. C. BURGER. *Z. anorg. allgem. Chem.* 121, 240-2(1922).—Power reflections were photographed to det. the nature of the combination of  $H_2O$  with the oxides of W and Mo. No attempt was made to assign a unique structure but the angles were merely compared. Thus for dry  $WO_3$  the sides of the angles corresponding to the concentric circles of the photograph were 0.207 (s), 0.231 (w), 0.252 (w), 0.292 (m), 0.325 (m), 0.357 (w), where s signifies strong, w weak, and m medium. For wet  $WO_3$  the values were 0.147 (m), 0.225 (s), 0.268 (w), 0.298 (m), 0.330 (w). Hence  $H_2WO_4$  is

entirely different from  $\text{WO}_3$ . The structure  $\text{H}_2\text{WO}_4$  is similarly proved, as well as the identity of  $\text{H}_2\text{MoO}_4$  as distinct from  $\text{MoO}_3$ .

G. I. CLARK

Base exchange in silicates. I. Exchange of alkalis and ammonia in the hydrated aluminium-alkali silicate, permutite. E. RAMANN AND A. SPENGLER. *Z. anorg. allgem. Chem.* 95, 115-128(1916); *Neues Jahrb. Min. Geol.* 1918, Ref. 252; cf. *C. A.* 14, 256.—The Na, K and  $\text{NH}_4$  permutites pass into one another by exchanging bases with Cl,  $\text{NO}_3$  or  $\text{SO}_4$  solns.

EDW. F. HOLDEN

The behavior of lead acetate toward potassium dichromate under different conditions. G. N. RIDLEY. *Chem. News* 125, 12-3(1922).—The difference in the pptn. of  $\text{PbCrO}_4$  in  $\text{H}_2\text{O}$ , EtOH,  $\text{CS}_2$  and glycerol is explained as due to the varying ionization of  $\text{Pb}(\text{OAc})_2$  and  $\text{K}_2\text{Cr}_2\text{O}_7$  in these solvents.

F. O. A.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

The preparation of samples for analysis. F. O. H. BINDER. *Chem.-Ztg.* 46, 584(1922).—Various errors that are likely to result from unsatisfactory methods of prepg. samples are discussed in detail, including such mishaps as the admixture of cigar ashes through carelessness.

W. T. H.

Reducing action of ferrous hydroxide. SUSUMU MIYOMATO. *J. Chem. Soc. (Japan)* 43, 397-438(1922).—A study of the oxidation-reduction potentials of  $\text{Fe}(\text{OH})_2$ ,  $\text{NO}_2^-$  and  $\text{NO}_3^-$ , full details of which are given, shows that it is possible by means of  $\text{Fe}(\text{OH})_2$  to reduce nitrite and nitrate to  $\text{NH}_3$  and to make an accurate analysis for either nitrite or nitrate. *Detn. of nitrite.*—Mix 0.1-0.3 g. of the nitrite with 15 g. of  $\text{FeSO}_4$  in a liter flask. Add 200 cc. of satd. KOH soln., heat and distil the resulting  $\text{NH}_3$  into a measured vol. of standard acid, finally titrating the excess with standard acid. The reaction is complete in 30-45 mins. *Detn. of nitrate.*—More time is necessary to complete the reduction of a nitrate and it is best to use 2 condensers, the first serving to prevent too great a concn. of the KOH soln. About 3.5 hrs. of heating are required and it is advisable to conduct an inert gas through the soln. while the reduction is taking place. Otherwise the method is the same as for the analysis of a nitrite. S. T.

Chlorination of mixed silver halides in Gooch crucibles. M. G. MELLON AND J. C. SIEGESMUND. *Proc. Indiana Acad. Sci.* 1921, 197-9.—Instead of chlorinating in a boat, the crucible contg. the mixed Ag halides may be placed inside a larger crucible, which should be covered with a watch glass with a hole in the center. Pass  $\text{Cl}_2$  into the crucible through a tube extending to within about 1 cm. of the bottom and heat the outer crucible somewhat in order to hasten the chlorination and volatilize the replaced Br and I. That the method does not lessen the accuracy is shown by results obtained with several samples.

W. T. H.

Iodometric determination of copper in the presence of iron. A. WÖBER. *Z. angew. Chem.* 35, 336-7(1922).—When a cupric soln. is in contact with  $\text{Fe}^{++}$ , there is a tendency for some  $\text{Cu}^+$  and  $\text{Fe}^{+++}$  to be formed so that on adding  $\text{NH}_4\text{OH}$  to ppt.  $\text{Fe}(\text{OH})_3$  there is danger of some Cu being left which will not be reduced in the iodometric titration. By bubbling air through the ammoniacal soln. the cuprous complex is oxidized to cupric complex. In the technical detn. of Cu and Fe in substances like blue vitriol, the following method has proved satisfactory: Use aliquot parts of a soln. prepared by dissolving about 5 g. of a representative sample in a little water and dilg. to exactly 100 cc. Take 10 cc. of this soln., and dil. with 50 cc. water in a 300 cc. glass-stoppered Erlenmeyer flask. Heat to about  $70^\circ$  and add concd.  $\text{NH}_4\text{OH}$  till the soln. is alkaline and about 4 cc. in excess. Pass a stream of air through the soln. and boil gently for 25 mins. Filter off the  $\text{Fe}(\text{OH})_3$  ppt. and det. the Fe iodometrically as

described by Treadwell. Take 50 cc. of the original soln. and subject it to the same treatment with air and  $\text{NH}_4\text{OH}$ . After heating for about 15 min. at  $50^\circ$ , while passing air through the soln., transfer the contents of the Erlenmeyer to a 100 cc. calibrated flask, make up to the mark, and mix well. Without allowing the  $\text{Fe}(\text{OH})_3$  ppt. to settle, pipet off 20 cc. and filter through a filter which has been moistened with  $\text{NH}_4\text{OH}$ . To remove traces of Cu from the ppt. dissolve it in a little  $\text{HCl}$  and ppt. with  $\text{NH}_4\text{OH}$  again. Heat the combined filtrate and boil about 25 mins. to remove most of the  $\text{NH}_3$ . Then add 5 cc. of 1  $N$   $\text{HCl}$ , cool, dil. to 100 cc., add 3 g.  $\text{KI}$  and titrate the liberated  $\text{I}_2$  with  $\text{Na}_2\text{S}_2\text{O}_4$  soln.

W. T. H.

**Electrolytic determination of antimony.** H. ANGENOT. *Bull. soc. chim. Belg.* 30, 268-70(1921).—Slightly high results are invariably obtained in the electrolytic detn. of Sb, but the percentage error is fairly const. under certain conditions. A. recommends the use of a cathode of dull Pt gauze on which the Sb is deposited at  $65-70^\circ$ , from a mixt. of 80 cc. of  $\text{Na}_2\text{S}$  soln. satd. in the cold, and 30 cc. of 30%  $\text{KCN}$  soln. by means of a current of 1 amp. The wt. of the dried deposit, if greater than 0.1 g., is multiplied by 0.9762. Hallmann (*Ingang. Diss.*, Aachen) in 1911 proposed the factor 0.9788. If a Pt capsule, slightly roughened by means of aqua regia as recommended by Classen, is employed as cathode, the results are about 2% higher than those obtained by A.'s method.

J. S. C. I.

**Chemical analysis with membrane filters. III. Application of membrane filters to volumetric analysis. Determination of manganese and chromium.** G. JANDER. *Z. anal. Chem.* 61, 145-71(1922); cf. *C. A.* 16, 220.—The use of membrane filters has been found to be very satisfactory for the collection of Mn sulfide and  $\text{PbCrO}_4$ , and volumetric methods for the detn. of Mn and Cr based on titration of these ppts. are described. Ppt. the Mn as the green sulfide from boiling ammoniacal solns. contg. 3% of  $\text{NH}_4\text{Cl}$  by means of a large excess of  $(\text{NH}_4)_2\text{S}$  and collect the ppt. on a membrane filter, wash first with a dil. soln. of the precipitant, then with 2% neutral  $\text{Na}_2\text{SO}_4$  soln. till free from  $\text{NH}_3$ , and dissolve in excess of 0.2  $N$  acid. Titrate the excess acid with 0.2  $N$   $\text{Na}_2\text{CO}_3$ , using methyl orange as indicator. Det. Cr present as chromate in alk. solns. contg. other oxidizing acids by pptg.  $\text{PbCrO}_4$  from the hot soln. after acidifying with  $\text{AcOH}$  in the usual way, dissolving the washed ppt. in  $\text{HCl}$ , adding an excess of standard  $\text{FeSO}_4$  to the soln. and titrating the excess with standard dichromate.

J. S. C. I.

**Modified method for the detection of tin.** H. HELLER. *Z. anal. Chem.* 57, 180-2 (1922).—Treat 1 cc. of the soln. to be tested with 0.5 cc. of 5%  $\text{KI}$  soln., and introduce 1 cc. of strong  $\text{H}_2\text{SO}_4$ , by means of a pipet, below the surface of the liquid so as to form a second layer. If Sn is present small characteristic yellow crystals of Sn iodide begin to sep. at the surface between the two layers. The ppt. is sol. in  $\text{HCl}$ , which should therefore be kept at a min. in the test soln. As and Sb interfere with the test.

J. S. C. I.

**The titration of zinc.** E. MONASCH. *Pharm. Weekblad* 58, 1652(1921).—The thiocyanate method of Kolthoff and van Dijk (*C. A.* 15, 3047) has been applied to the estn. of Zn in alloys. The potassium mercuric thiocyanate soln. is prepd. by dissolving 23.7 g. of  $\text{Hg}(\text{CNS})_2$  in a concd. aq. soln. of 14.4 g. of  $\text{KCNS}$ , and is stable for many months. Compds. of all the common metals interfere, but ferric and Al salts do not affect the reaction. Since M. uses Al in the sepn. of Zn from alloys, the method is suitable for the estns., but Fe salts must first be oxidized by means of peroxide. J. C. S.

**Zinc purpurate as a reagent for mercury salts.** G. DENIGÈS. *Bull. soc. pharm. Bordeaux* [1] 1921; *Ann. chim. anal.* 3, 251-2(1921).—The reagent is prepd. by heating 2 g. of uric acid with 2 cc. of  $\text{HNO}_3$  ( $40^\circ \text{Bé.}$ , sp. gr. 1.38), dilg. the soln. with 2 cc. of water, continuing the heating until a clear liquid is obtained and dilg. this to 100 cc.;

if 10 cc. of this liquid is boiled for 5 mins. with the addn. of 2 g. of granulated Zn, a yellow-orange coloration develops, owing to the formation of Zn purpurate. When a mercuric salt soln. is treated with a small quantity of the Zn purpurate soln. and a few drops of Na acetate soln., a peach-blossom-colored ppt. of Hg purpurate is produced. The reaction may be obtained with as little as 0.4 mg. of Hg per cc. of soln. Ag salts yield a violet-colored ppt. with the reagent.

J. S. C. I.

**Volumetric estimation of potassium.** MACHELIDT. *Woch. Bran.* 39, 23-4(1922).—Prep. a standard soln. of NaH tartrate by dissolving 80 g. of tartaric acid and 16 g. of NaOH in water and dil. to 1 l. Add 6 g. of KH tartrate and shake the soln. for several hrs. Filter off 30 cc. and titrate with 0.1 N Ba(OH)<sub>2</sub> soln. Shake a second 30 cc. for 1 to 2 hrs. with 0.5-0.75 g. of the salt mixt. to be tested, filter the soln. into a tared basin and, without washing the filter, titrate with the Ba(OH)<sub>2</sub> soln. Weigh the soln. before and after filtering, and make allowance for the loss. The difference between the two titrations is calcd. to K<sub>2</sub>O.

J. C. S.

**The determination of calcium and magnesium in different saline media.** E. CANALS. *Bull. soc. chim.* 29, 152-8, 583-5(1921); cf. C. A. 16, 1543.—The various elements likely to be present in the ash of plants which will tend to influence the accuracy of the Ca and Mg detns. are considered and suitable ways of overcoming the interference are discussed and tested experimentally. For example with Fe and Al there is likely to be pptn. of ferrites and aluminates of Ca and Mg when the Fe is removed. To some extent this may be prevented by pptn. of the Fe and Al as phosphate in the presence of AcOH.

W. T. H.

**Some experiments in the determination of lead in lead amalgam.** M. G. MELLON AND H. F. REINHARD. *Proc. Indiana Acad. Sci.* 1921, 189-95.—The methods hitherto used for the detn. of Pb in amalgams are discussed critically and shown to be not altogether satisfactory for the estn. of small quantities of Pb in the presence of large quantities of Hg. The method recommended depends upon the fact that Pb will go into soln. but Hg will not when the amalgam is treated with Cu(NO<sub>3</sub>)<sub>2</sub> soln.; the dissolved Pb may be pptd. and weighed as PbCrO<sub>4</sub>. Cover the weighed amalgam with 25 cc. of 10% Cu soln., allow to stand 15 to 24 hrs., decant through a filter and wash the amalgam thoroughly. Add to the filtrate a few drops of AcOH and enough K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> soln. to ppt. all of the Pb. Filter into a Gooch crucible, wash, dry at 120° and weigh as PbCrO<sub>4</sub>.

W. T. HALL

**The analysis of aluminium alloys.** ANTON DRENNER. *Chem.-Ztg.* 46, 188(1922).—Treat the soln. of Al and Zn hydroxides in alkali hydroxide soln. with Na<sub>2</sub>S, collect the ppt. on a filter, wash with hot water, and dissolve in dil. HCl. Treat the cold soln. with Na<sub>2</sub>CO<sub>3</sub> and collect the pptd. ZnCO<sub>3</sub>, wash, ignite, and weigh as ZnO. The method is more rapid than that involving sepn. of the ZnS from org. acid solns.

J. C. S.

**Quantitative analysis of aluminium alloys, especially of "Duralumin."** E. MENDES DA COSTA-VET. *Chem. Weekblad* 19, 249-51(1922).—Technical Al alloys contain about 3.5% Cu, 0.5-1.0% Mn, 0.5% Mg and traces of Fe and Si. It was found that the methods, devised so far, do not satisfactorily sep. Mg and Mn. The following method is proposed: Ppt. Fe, Mn and Al by double pptn. with NH<sub>4</sub>OH. The Mn is not pptd. entirely, but Mg remains entirely in the soln. In the filtrate Mg and (a part of) Mn is pptd. by means of phosphate, dried and weighed. This ppt. is then dissolved again, the Mn contained in it is detd. by titrating with KMnO<sub>4</sub> and subtracting. The whole content of Mn is detd. in a sep. sample by titrating.

R. BRUTNER

**Determination of magnesium in alloys.** E. WILKE-DÖRFURT. *Wiss. Veröffent. Siemens-Konzern* 1, 84-5(1921).—In the detn. of Mg in Zn-Al Mg alloys contg. little Mg, by the usual method in which ZnS and Al(OH)<sub>3</sub> are pptd. together and Mg is subsequently pptd. as phosphate, the values obtained are much too low, owing to some of

the Mg being pptd. along with the Zn and Al. The following method avoids this source of error. Dissolve 1 g. of alloy as usual, evap. the soln. to dryness, and dissolve the residue in water. Filter the soln. to remove silica, and add 150 cc. of dil.  $\text{NH}_4\text{Cl}$  soln., 15 g. of tartaric acid, and 70 cc. of strong  $\text{NH}_4\text{OH}$ . Ppt. Mg as phosphate by means of Na phosphate, and after allowing to stand for 12 hours, collect the ppt., wash with distd. water, and det. as Mg pyrophosphate. Zinc is precipitated as sulfide from soln. in  $\text{AcOH}$ , and Al detd. by difference. J. S. C. I.

**Microchemical estimation of nitrogen.** C. VALLÉE AND M. POLONOVSKI. *Compt. rend. soc. biol.* 84, 900-1 (1921).—For the microchem. estn. of N, the substance is heated with 1 cc. of  $\text{H}_2\text{SO}_4$ , 1 g. of K sulfate, and a small piece of quartz, and dild. with 6 cc. of water. After addn. of 3 cc. of NaOH soln., the  $\text{NH}_3$  is carried over by a current of air into 0.02 N  $\text{H}_2\text{SO}_4$ . J. C. S.

**Estimation of cyanogen.** H. YANAGISAWA. *J. Pharm. Soc. (Japan)* No. 483, 369-77 (1922).—By heating a cyanogen compd. in a sealed tube with dil.  $\text{H}_2\text{SO}_4$ , all of the N can be converted into  $\text{NH}_4\text{HSO}_4$  from which  $\text{NH}_3$  can be obtained as in the Kjeldahl method for detg. N. Heating at  $200^\circ$  for at least 4 hrs. is recommended for the preliminary decomposition. The method was tested with  $\text{K}_4\text{Fe}(\text{CN})_6$  and should be applicable to other cyanogen complexes. S. T.

**A new method for the determination of bisulfites.** FR. KÜHL. *J. Soc. Leather Trades Chem.* 6, 199-200 (1922).—Titrate a soln. of 2 g. of the sample with standard NaOH till neutral to phenolphthalein. Add 10 cc. of neutral 40%  $\text{HCHO}$  and titrate to neutrality with standard HCl. In combining with the sulfite, the  $\text{HCHO}$  liberates one mol. of NaOH for each mol. of  $\text{Na}_2\text{SO}_3$  present. The difference between the 2 titrations indicates the amt. of free acid or of normal sulfite present. J. A. WILSON

**Analysis of sodium sulfide crystals.** J. A. WYLER. *Color Trade J.* 9, 159-61 (1921).—Details are given for the detn. of  $\text{Na}_2\text{S}$ ,  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{Na}_2\text{CO}_3$  and  $\text{NaSH}$ ,  $\text{Na}_2\text{SO}_4$ , NaCl, total Na, total S, Fe and Al oxides, Ca and Mg. CHAS. E. MULLIN

**Rapid estimation of sodium sulfate in commercial salt-cake.** M. MATSUI AND S. KIMURA. *J. Chem. Ind. (Japan)* 25, 111-7 (1922).—A modification of Isbert and Venator's method (*Z. angew. Chem.* 4, 66) is described. Dissolve about 0.5 g. of the sample in a little water, to which 1 cc. of 5 N  $(\text{NH}_4)_2\text{CO}_3$  soln., 1 cc. of 1%  $(\text{NH}_4)_2\text{SO}_4$  soln., 12 cc. of alc. (about 90%), and 10 cc. 25%  $\text{NH}_4\text{OH}$  are added. Stir the mixt. for 30 min. or frequently agitate and allow to stand overnight, and then filter. Evap. the clear filtrate to dryness, ignite the residue in a Pt crucible and weigh. By deducting from the wt. that of the  $\text{Na}_2\text{SO}_4$  corresponding to the NaCl found in the original sample by titration, the real  $\text{Na}_2\text{SO}_4$  originally present is found. Six hrs. is sufficient for the whole detn. J. S. C. I.

**Analysis of sodium hyposulfite.** M. J. HARNIST. *Color Trade J.* 9, 77-9 (1921).—**Detn. of NaCl.**—Dissolve 0.5 g. of the sample in 200 cc. of dil. NaOH, add 5-7 g. of  $\text{Na}_2\text{O}_2$  and boil 1 hr. or until oxidation is complete. Cool, acidulate with  $\text{HNO}_3$ , filter and det. the Cl as usual. **Detn. of Zn.**—Dissolve 0.01-0.05 g. of sample in about 250 cc. of water contg. sufficient  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$  to keep the Zn dissolved. Heat nearly to boiling, ppt.  $\text{ZnS}$  by the addition of  $\text{Na}_2\text{S}$ , filter and det. the S in the ppt. by the usual iodometric titration. **Detn. of Ca.**—Dissolve 5 g. of the sample in 200 cc. of 1.2 N HCl, boil to coagulate the S, filter and proceed as in the analysis of limestone. **Detn. of Fe.**—Use the ppt. of  $\text{Fe}(\text{OH})_3$  obtained in the detn. of Ca. **Detn. of S.**—Dissolve 1 g. of the sample in dil. NaOH soln., add  $\text{Br}_2$  in excess to oxidize all of the S to  $\text{SO}_4$ , boil off excess of  $\text{Br}_2$  and ppt. as  $\text{BaSO}_4$  in dil. HCl soln. **Detn. of total Na.**—In this detn. it is assumed that no other cation is present in appreciable quantity and that the residue obtained by ignition with  $(\text{NH}_4)_2\text{CO}_3$  is  $\text{Na}_2\text{SO}_4$ . **Volumetric evaluation.**—Dissolve 2.5 g. in 1% NaOH soln. and titrate out of contact with air with indigo soln. to a yellow or brown color. Direc-

tions are given for prep. and standardizing the indigo soln. and a sketch of the app. used to prevent atmospheric oxidation.

CHAS. E. MULLIN

**Determination of oxalic acid.** A. BAU. *Woch. Bras.* 38, 113-5, 122-4(1921); cf. *C. A.* 14, 3618, 3619, 3730; 15, 4018.—Application of the Ca acetate method (*loc. cit.*) to the detn. of oxalic acid in plant materials, etc., showed that the barley plant contained 0.027, hops 0.567-0.647, pine needles 0.44, beer wort 0.004% of oxalic acid. The first 3 results are expressed as percentages of the dry substance. J. S. C. I.

**Estimation of chlorine in benzaldehyde.** SCHIMMEL & Co. *Ber. Schimmel & Co.* 1921, 56-61.—BzH is burnt in a small lamp so constructed that the amt. of liquid burnt may be found by weighing at the beginning and end of the expt. The products of combustion are passed through two U tubes contg. glass beads moistened with 0.02 N KOH soln., foaming being prevented by the use of a few drops of petroleum. The washings from the absorption app. are united and, after addn. of an equiv. amt. of 0.02 N H<sub>2</sub>SO<sub>4</sub> concd. in a closed flask. The soln. is then made alk. to phenolphthalein and the color discharged by one or two drops of 0.02 N H<sub>2</sub>SO<sub>4</sub>. Five drops of 10% K<sub>2</sub>CrO<sub>4</sub> soln. are added and the Cl is estd. in the usual way with 0.02 N AgNO<sub>3</sub> soln. J. C. S.

**Analysis of acetic anhydride.** C. E. SAGE. *Perfumery Essent. Oil Record* 13, 172 (1922).—In titrating Ac<sub>2</sub>O with 0.5 N alkali in the presence of phenolphthalein, the observation was made that certain samples of Ac<sub>2</sub>O fail to give a sharp end-point with 0.5 N acid. S. thereupon adds an excess of alkali, allows it to stand for a short while, retitrates with a known quantity of acid and finishes the detn. with more alkali. He thus eliminates the necessity of heating under a reflux. The reason why phenolphthalein is not sensitive in certain cases appears to have some connection, as yet unexplained, with the fact that such samples usually give the CHI<sub>3</sub> test with I and soda. Furthermore, certain faults in odor are traced back to products emanating from samples of Ac<sub>2</sub>O yielding the CHI<sub>3</sub> reaction. W. O. F.

BATSON, R. G. and HYDE, J. H.: **Mechanical Testing.** Vol. I. London: Chapman & Hall, Ltd. 413 pp. Reviewed in *Chem. Met. Eng.* 27, 178(1922).

FENTON, H. J. H.: **Notes on Qualitative Analysis, Concise and Explanatory.** New York: MacMillan Co. 47 pp. \$1.25.

FENTON, H. J. H.: **Notes on Qualitative Analysis. Supplement.** Cambridge: Cambridge Univ. Press. 202 pp. 3s. 6d. Reviewed in *Chem. Age* (London) 6, 793 (1922).

INBORSON, F. and ARCHISON, L.: **The Analysis of Non-Ferrous Alloys.** 2nd Ed. revized. London: Longmans, Green & Co. 246 pp. 12s. 6d. Reviewed in *Chem. News* 124, 385(1922).

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

**Alteration of silicates by Sonstadt's solution.** T. L. WALKER. *Am. Mineral.* 7, 100-2(1922).—In sepg. zeolite powders for anal. by suspension in K<sub>2</sub>HgI<sub>4</sub> solns. it was found that several of them are attacked, with nearly complete replacement of the original Na by K. Thus a gmelinite sepd. by org. liquids gave Na<sub>2</sub>O 10.08, K<sub>2</sub>O 0.60, but the same mineral sepd. as above gave Na<sub>2</sub>O 1.20, K<sub>2</sub>O 14.86%. Okenite originally contg. 0.60 K<sub>2</sub>O showed after the sepn. 2.24%. Some irregularities in published zeolite analyses may be due to reactions having occurred with sepg. solns. E. T. W.

**Crystallization of sodium chloride on mica.** GEORG KALB. *Centr. Min. Geol.* 1917, 145-6.—The NaCl takes up a definite crystallographic position, showing the influence of the mica mols. E. T. W.

**Tellurium from Ruda, Erzgebirge.** F. BERWIRTH. *Mitt. Wiener mineral. Ges.* No. 19, 54-5(1916); *Neues Jahrb. Min. Geol.* 1919, Ref. 273.—A mineral thought to be stibnite proved on testing to be Te. It occurs in calcite. Edw. F. HOLDEN

**A new nickel arsenic mineral.** O. HACKL. *Verh. geol. Staatsanst. Wien* 1921, 107-8.—A small specimen of white metallic cubes gave on anal.: As 30.64, Ni 67.11, Cu 0.99, Fe 0.61, Co 1.23, Ag(cupellation) 0.1655, sum 100.66%. It thus appears to be a new mineral of the formula  $Ni_2As$ , although final establishment of this awaits finding of additional material. E. T. W.

**An unusual alteration product from Park City, Utah.** W. H. NEWHOUSE. *Am. Mineral.* 7, 108-9(1922).—Action of Cu solns., derived by weathering of the upper part of the ores, on galenite has resulted in the formation of a deep blue product. This may be what has been named alisonite or cuproplumbite, but its compn. is not definitely known. E. T. W.

**Artificial production of a variety of cotunnite.** S. MEUNIER. *Compt. rend. somm. soc. géol. France* 1918, 32-4; *Rev. géol.* 2, 132(1921).—A specimen of impure fluorite was left in HCl for 27 years, and became coated with crystd. cotunnite ( $PbCl_2$ ) containing K. E. T. W.

**Delafossite from Kimberly, Nevada.** A. F. ROGERS. *Am. Mineral.* 7, 102-3(1922).—A third occurrence of this rare mineral, cuprous metaferite,  $Cu_2O.Fe_3O_4$ , has been discovered. It occurs in small spherulites with metallic luster imbedded in clay, and was identified by qual. tests, the HCl soln. showing both  $Fe^{+}$  and  $Fe^{++}$ , as the  $Ca^{++}$  reduces part of the  $Fe^{+++}$ . Delafossite should certainly be recognized as a distinct mineral species. E. T. W.

**Observation on the mineralizing calcite of certain fossils.** S. MEUNIER. *Compt. rend. somm. soc. géol. France* 1917, 83-4.—The calcite explodes violently on heating, and on soln. in acid leaves a dark colored org. residue. It may be termed "patagossile" from the Greek for explosion. E. T. W.

**Aragonite of Japan.** M. WATANABE. *J. Geol. Soc. Tokyo* 22, 258-8(1915); 23, 1-25, 68-84, 110-26(1916); *Mineralog. Abstracts* 1, 63.—The Japanese occurrences of aragonite are: (1) those deposited by hot springs, (2) those from metalliferous deposits, (3) those found in cavities of serpentine. Globular specimens from Takasegawa in Shinano, previously described as aragonite, contain calcite also. Edw. F. HOLDEN

**The true nature of roasite.** C. PERRIER. *Rend. accad. Lincei* 30, 119; *Am. Mineral.* 6, 166(1921).—See C. A. 16, 2283. E. T. W.

**The plagioclase feldspars as a case of atomic isomorphism.** EDGAR T. WHERRY. *Am. Mineral.* 7, 113-21(1922).—It is shown that the structural formula view-point is incapable of accounting for the isomorphism of the plagioclases, that the arithmetical view-point mistakes a corollary for a cause, and that only the atomic isomorphism view-point really corresponds to the data. As Na is indicated by X-ray measurement to occupy approx. the same vol. as Ca, and Al as Si, the two feldspars may well have identical geometrical structures; the valence relations in soln. merely require the one replacement to be accompanied by the other, and do not persist into the solid form of the compds. Orthoclase ( $KAlSi_3O_8$ ) and carnegieite ( $Na_2Al_2Si_2O_8$ ) cannot be isomorphous with anorthite ( $CaAl_2Si_2O_8$ ) because the K atom of the one, and still more the 2 Na atoms of the other, demand more space than displacement of the Ca can furnish. The simplest formulas adapted to bring out all the relations are: albite,  $NaAl(Si_2O_6)$ ; anorthite  $CaAl(AlSi_2O_6)$ . E. T. W.

**Specific gravity and refraction of the potash-soda-feldspars.** D. BYELVANKIN. *Bull. Petrograd Polytech. Inst.* 24, 437-52(1915); *Mineralog. Abstracts* 1, 89-90.—Analyses of K-Na feldspars from the literature showed no relations between compn., sp. gr., and



$n_D$ . New detns. were made, and the sp. gr. and  $n$ , calcd. for the K-Na portion, when plotted against Ab%, fall in a straight line. The results are:

	I.	II.	III.	IV.
SiO <sub>2</sub> .....	64.00	65.33	63.67	66.46
Al <sub>2</sub> O <sub>3</sub> .....	19.25	18.82	19.60	18.89
Fe <sub>2</sub> O <sub>3</sub> .....	—	—	—	0.75
BaO.....	0.41	—	0.98	—
CaO.....	0.15	0.39	0.40	0.61
Na <sub>2</sub> O.....	1.86	4.23	3.62	7.68
K <sub>2</sub> O.....	14.01	10.20	11.16	5.17
Ign.....	0.50	0.78	0.33	0.69
Sum.....	100.18%	99.75%	99.76%	100.25%
Sp. gr.....	2.570	2.582	2.595	2.606
$\alpha$ .....	1.5191	1.5219	1.5223	1.5255
$\beta$ .....	1.5228	1.5257	1.5260	1.531
$\gamma$ .....	1.5249	1.5275	1.5283	1.532

(I) Adularia, St. Gothard; (II) orthoclase, Ceylon; (III) microcline-micropertthite, Savelev ravine, Ilmen Mts.; (IV) anorthoclase, Berkum, Rhine. EDW. F. HOLDEN

**Aegerite-augite crystals from a microsanidine out of the trachyte from Mount Cis, Ross Island.** F. COHEN. *Brit. Antarctic Exp.* 1907-9; *Rept. Sci. Investigations Geol.* 2, 149-51(1916); *Mineralog. Abstracts* 1, 35.—These crystals were found by Thomson to have an abnormally high extinction angle  $43^\circ$ , on a section nearly parallel to (010). The following forms were found:  $a(100)$ ,  $b(010)$ ,  $m(110)$ ,  $u(111)$ ,  $s(111)$ ,  $o(221)$ ,  $e(011)$ ,  $z(021)$ . The calcd. elements are  $a:b:c = 1.08909:1:0.60016$ ;  $\beta = 74^\circ 23'$ . EDW. F. HOLDEN

**Bustamite from Franklin Furnace, N. J.** E. S. LARSEN AND E. V. SHANNON. *Am. Mineral.* 7, 95-100(1922).—A pale pink mineral occurring with albite and other minerals, some undescribed, has been analyzed, giving: SiO<sub>2</sub> 48.44, FeO 0.27, CaO 25.20, MnO 25.20, MgO 0.65, ZnO 0.53, loss on ign. 0.34, sum 100.63%. This corresponds to 4CaSiO<sub>3</sub>·3MnSiO<sub>3</sub>, but crystallographic measurement of cleavage angles indicates the system to be triclinic like rhodonite (MnSiO<sub>3</sub>) rather than wollastonite (CaSiO<sub>3</sub>). Optically it is—with  $2V = 44^\circ$ ,  $\alpha = 1.662$ ,  $\beta = 1.674$  and  $\gamma = 1.676$ . Material labeled bustamite from Italy shows optical properties close to rhodonite; so it must be low in Ca. It is concluded that bustamite is a triclinic pyroxene, to be considered a subspecies of rhodonite, with the approx. formula CaMn(SiO<sub>3</sub>)<sub>2</sub>. E. T. W.

**Augite and hornblende from Kilimanjaro.** H. S. WASHINGTON AND H. E. MERWIN. *Am. Mineral.* 7, 121-5(1922).—The anal. of augite from this locality in the literature is inaccurate, and a new one gave: SiO<sub>2</sub> 48.16, TiO<sub>2</sub> 0.59, Al<sub>2</sub>O<sub>3</sub> 8.45, Fe<sub>2</sub>O<sub>3</sub> 2.86, FeO 3.55, MnO 0.10, MgO 14.23, CaO 21.69, Na<sub>2</sub>O 0.91, K<sub>2</sub>O 0.10, H<sub>2</sub>O + 0.15, sum 100.79%. Its  $n$ s average:  $\alpha = 1.69$ ,  $\beta = 1.70$ ,  $\gamma = 1.72$ ;  $2V$   $60^\circ$ . This augite thus resembles those from other volcanoes, despite marked differences in the chem. character of the magmas. Anal. of hornblende gave: SiO<sub>2</sub> 41.97, Al<sub>2</sub>O<sub>3</sub> 12.59, Fe<sub>2</sub>O<sub>3</sub> 4.89, FeO 5.80, MgO 14.20, CaO 11.99, Na<sub>2</sub>O 3.17, K<sub>2</sub>O 1.63, H<sub>2</sub>O + 0.26, TiO<sub>2</sub> 4.20, sum 100.50%. The  $n$ s are  $\alpha = 1.675$ ,  $\beta = 1.691$ ,  $\gamma = 1.701$ . The Na, K and Ti contents are notably high. Hornblendes from other volcanoes with decidedly alkalic lavas have similar compns., and the high Na is significant of some relation between the magma and the compn. of the hornblendes crystg. out. E. T. W.

**Asbestos in the Union of South Africa.** A. L. HALL. *Union S. Africa Geol. Survey Mem.* 12, 152 pp.(1918); cf. C. A. 14, 513.—The occurrence and geology of several types of asbestos are described, chem. data being quoted. The form known as amosite

has now been analyzed, but shows wide variation. Its av. compn. is:  $\text{SiO}_2$  49.6,  $\text{Al}_2\text{O}_3$  2.3,  $\text{FeO}$  (including  $\text{Fe}_2\text{O}_3$  from alteration) 39.6,  $\text{MgO}$  4.8,  $\text{CaO}$  0.5,  $\text{H}_2\text{O}$  3.2, sum 100.0%. [It thus represents grunerite, ferroanthophyllite (Shannon, C. A. 15, 3262) or both. **ABSTR.**]

E. T. W.

**Thortveitite**, a silicate of scandium. JAKOB SCHETELIG. *Norsk. Geol. Tidsskr.* 6, 233-44 (1922).—Thortveitite (C. A. 6, 726; 15, 41) is found in feldspar quarries in Sætersdalen, Norway, as large, grayish green, prismatic crystals resembling epidote in appearance. These are monoclinic ( $a:b:c = 0.7674:1:0.5569$ ,  $\beta = 77^\circ 28'$ ) and usually twinned on  $m(110)$ ;  $H = 6-7$ , optically,  $\alpha$  1.7561,  $\beta$  1.7926,  $\gamma$  1.8093. **Anal. I** by J. Schetelig, **II** by J. Štěrbá-Böhm, and **III** by F. Tauchert:

	$\text{SiO}_2$	$\text{Sc}_2\text{O}_3$	$\text{Y}_2\text{O}_3$	$\text{TiO}_2$	$(\text{Di}, \text{Er})_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{FeO}$	$\text{CaO}$	$\text{Ign.}$	Sum	d.
I.	42.9	37.6	17.7*			2.1	0.8	—	0.4	100.9	3.57
II.	45.45	42.06	8.89†			2.83	—	0.51	0.54	100.28	3.566
III.	45.55	38.61	10.47‡	4.26§		3.13	—	—	—	100.02	—

\* Mol. wt. 270.

† Mol. wt. 320.

‡ Mol. wt. 226.

§ Mol. wt. 380.

These lead to the diorthosilicate formula  $(\text{Sc}, \text{Y})_2\text{Si}_2\text{O}_7$ , analogous to that of thalenite (*Geol. För. Förh.* 20, 308-12; *Bull. Geol. Inst. Univ. Upsala* 4, 1-15 (1898)). Spectroscopic analysis shows the presence of several other rare-earths, but an absence of Ce, Zr, etc.

J. C. S.

The presence of the clinozoisite end-member in the classical locality of epidote in the Ala Valley. F. BALZAC. *Atti accad. sci. Torino* 51, 899-911 (1916); *Mineralog. Abstracts* 1, 77-8; cf. Silprandi, C. A. 13, 1992.—Five pale yellow crystals of epidote from the Colle del Paschietto are described. Some new vicinal forms are noted. These crystals approach the clinozoisite member of the epidote group,  $\beta_D = 1.7113$  and 1.7209, sp. gr. = 3.379, 3.380, 3.383, and 3.385; of rose transparent crystals from Goslerwand = 3.369.

EDW. F. HOLDEN

A third occurrence of datolite from the Fassatal. R. KOEHLIN. *Min. petr. Mitt.* 33, 517-8 (1915); *Mineralog. Abstracts* 1, 30.—White crystals on the prehnite from Monte Rondella, previously recorded as titanite, are in reality datolite. Several new forms were observed.

EDW. F. HOLDEN

Prehnite from Adams Sound, Baffin's Island. H. SIMMERSBACH. *Z. prakt. Geol.* 25, 139-41 (1917).—A prehnite high in Fe,  $\text{Fe}_2\text{O}_3 = 6.58\%$ , occurs in calcite-quartz veins with galenite and pyrite. Its sp. gr. = 2.924.

EDW. F. HOLDEN

The johannite from Joachimsthal. B. JĚZEK. *Rozprawy Česká Akad.* (cl. 2) 24, no. 21, 12 pp. (1915); *Bull. intern. acad. sci. Bohême* 20, 358-72 (1916); *Mineralog. Abstracts* 1, 248.—The minute acicular or bladed crystals are monoclinic in habit;  $a:b:c = 1.0527:1:1.395$ ,  $\beta = 84^\circ 18'$ , and 10 forms are noted. The optical characters indicate it to be triclinic. Sp. gr. = 3.307;  $H$  2; cleavage is parallel to (001) and (011). Lindacker's analyses (1857) suggest the formula  $\text{CuSO}_4 \cdot (\text{UO}_2)_4(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ .

EDW. F. HOLDEN

Sky glasses or glass meteorites. VICTOR GOLDSCHMIDT. *Z. Krist.* 56, 420-1 (1921).—The moldavites, etc., found at various places on the earth are held to be of meteoric origin, and to represent the result of fusion and rapid solidification of portions of matter (cosmolites) moving through space between the earth and the moon. Their surface features show how they have cooled.

E. T. W.

Microscopic investigation of a meteoric stone from Rechki, Sumli district, government of Charkov. P. N. CHIRVINSKII. *Zapís. Kiensk. Obshest. Estestvoisp. (Mém. Soc. Naturalistes Kiev)* 25, 13-20 (1915); *Mineralog. Abstracts* 1, 44.—This stone, a gray chondrite, fell Apr. 9, 1914. Its weight was 5.3 kg., sp. gr. 3.572. It is estd. to con-

tain silicates (pyroxenes and olivine) 82.46, Ni-Fe 8.94, troilite 7.80, chromite 0.80%.

EDW. F. HOLDEN

The properties and uses of mica. ANON. *Electrician* 88, 446-7(1922).—A table shows the class, mineralogical group, general characteristics, and the relative hardness of the micas. Tables of identification tests, indicating the selection of micas suitable for specified purposes, are given. Satisfactory specifications for micas have not been devised. In most cases more than one kind may be employed for a specific purpose.

W. H. BOYNTON

Diatomaceous earth near the east end of Loch Leven, Kinross-shire. J. DUNCAN. *Trans. Edinburgh Geol. Soc.* 11, 3-5(1920); *Mineralog. Abstracts* 1, 88.—Thin layers of diatomaceous earth occur in peat beds. The deposit is too small to be of value. A list of other Scottish localities is given.

EDW. F. HOLDEN

Petrology of the alkaline rocks of Mount Erebus, Antarctica. H. I. JENSEN. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Invest. Geol.* 2, 93-128(1916); *Mineralog. Abstracts* 1, 34-5.—The rocks of Mt. Erebus include trachytes, acid and basic kenytes, trachydolerites, leucitophyres, tephrites, basanites, olivine-basalts, olivine-poor basalts, limburgites, magma-basalts, and magnetite-basalts. All are regarded as differentiates of an intermediate kenyte magma. The rocks of Cape Bird include trachytes, kulaites, kulaitic basalts, dolerites, and limburgitic dolerites. Analyses of 11 rocks from Mt. Erebus and of 5 from Cape Bird are included.

EDW. F. HOLDEN

Petrology of the dolerites collected by the British Antarctic Expedition, 1907-9. W. N. BENSON. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Investigations Geol.* 2, 153-60(1916); *Mineralog. Abstracts* 1, 35-6.—The rocks are erratics from Cape Royds, consist mainly of plagioclase and pyroxene, and are called quartz-dolerites. *Enstatite-augite* is abundant (color pale grayish purple,  $Z : c = 40-45^\circ$ ,  $2E$  variable). Bronzite-bearing and porphyritic varieties occur; there is a biotite-rich variety near Essexite. These dolerites closely resemble the Cretaceous dolerites of Tasmania.

E. F. H.

Pyroxene granulites collected by the British Antarctic Expedition. A. B. WALKOM. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Investigations Geol.* 2, 161-8(1916); *Mineralog. Abstracts* 1, 36-7.—Erratics from Cape Royds; these rocks are composed of pale-green pyroxene, plagioclase, and some quartz, with accessory sphene. *Scapolite* occurs in some varieties.

EDW. F. HOLDEN

Petrological notes on erratics collected at Cape Royds. W. G. WOOLNOUGH. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Investigations Geol.* 2, 169-188(1916); *Mineralog. Abstracts* 1, 37.—Thirty-one erratics included: pegmatite, aplite, syenite, sodalite-syenite, quartz-diorite, granophyre, feldspar-porphyr, minette, vogesite, porphyrite, diabase-porphyr, sölvbergite, sapphire-bearing trachyte, spherulitic trachyte, porphyritic basalt, actinolite- and tremolite-gneiss, actinolite- and tremolite-schist, spotted schist, phyllite, quartz-schist, and micaceous sandstone. Sodalite-syenite contains a golden-yellow mineral, perhaps *wöhlerite*; extinction  $32^\circ$  from length, elongation  $+$ , cleavage parallel to length,  $n$  and birefringence high, biaxial,  $2V$  fairly large, decided dispersion  $\rho > \nu$ .

EDW. F. HOLDEN

Petrology of some limestones from the Antarctic. E. W. SEEDS. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Investigations Geol.* 2, 189-200(1916); *Mineralog. Abstracts* 1, 37-8.—The microscopical structure and mineral compn. of 13 limestones from various localities are described, with 1 analysis.

EDW. F. HOLDEN

Petrology of rock collections from the Mainland of South Victoria Land. D. MAWSON. *Brit. Antarctic Exp. 1907-9, Rept. Sci. Investigations Geol.* 2, 201-34(1916); *Mineralog. Abstracts* 1, 38.—The following rocks are described: granite, quartz-porphyr, feldspar porphyry, aplite, pegmatite, kersantite, diorite, gabbro, dolerite, sedimentary and metamorphic rocks. Seven analyses are given.

EDW. F. HOLDEN

**Geology of the East Kilsyth Hills.** J. V. HARRISON. *Trans. Geol. Soc. Glasgow* 15, 315-33 (1916); *Mineralog. Abstracts* 1, 60.—At this locality in Stirlingshire the lavas include various types of basalt, mugearite, keratophyre, bostonite, and quartz-dolerite. Estimates of mineral compn. and sp. gr. are given for some types, an anal. of a basalt, and alkali detn. for a bostonite. The origin of porphyritic types of lava, zoning of feldspars, and conditions bringing about ophitic structure are discussed. E. F. H.

**The igneous rocks of Bute.** Wm. R. SMELLIE. *Trans. Geol. Soc. Glasgow* 15, 334-74 (1916); *Mineralog. Abstracts* 1, 60-1.—The following igneous rocks are described: epidiorite; Lower Carboniferous agglomerates, tuffs, trachyte and basalts; all stages of albitization and analcization are recorded; vesicles contain agate and jasper, and in one case garnets are mentioned; Permo-Carboniferous quartz- and olivine dolerites; Tertiary hypersthene-dolerite, quartz-oligoclase-porphyr, olivine dolerite, and tachylite. Three analyses are given. EDW. F. HOLDEN

**Primary analcite and analcization.** ALEX. SCOTT. *Trans. Geol. Soc. Glasgow* 16, 34-45 (1916); *Mineralog. Abstracts* 1, 61.—Considering the evidence for and against the primary origin of the analcite in Scottish rocks, S. considers that it is probably primary in such types as analcite-basalt, crinanite, teschenite, lugarite, essexite, and theralite. EDW. F. HOLDEN

**Volcanic necks in northwest Ayrshire.** G. V. WILSON. *Trans. Geol. Soc. Glasgow* 16, 86-99 (1916); *Mineralog. Abstracts* 1, 61.—Thirty-one volcanic necks are described. The igneous rocks are trachytes, basalts, and dolerite, tuffs and plugs. The following detns. were made on large crystals from basalt-tuffs: biotite,  $2H = 20^{\circ}23'$ ,  $\beta$  and  $\gamma = 1.622$ ; basaltic hornblende, opt.—,  $\beta$  and  $\gamma = 1.6915$ ,  $Z : c = 6^{\circ}$ , pleochroism  $b$  pale yellowish green,  $c$  greenish brown; augite, slightly titaniferous, opt. +, opt. ax. pleo.  $b(010)$ ,  $\beta$  and  $\gamma = 1.7067$ ,  $Z : c = 44^{\circ}$ , pleo.  $b$  pale purple,  $c$  pale yellow. E. F. H.

**The trachytic and allied rocks on the Clyde Carboniferous lava-plateaux.** G. W. TYRELL. *Proc. Roy. Soc. Edinburgh* 36, 288-99 (1917); *Mineralog. Abstracts* 1, 62.—These rocks are classified as albite-bostonite, -trachyte, and -keratophyre; bostonite, trachyte, and keratophyre (albite and orthoclase equal); quartz-keratophyre and felsite. Four complete and 2 partial analyses are given and discussed. E. F. H.

**The Cheese Bay sill, Gullane.** T. C. DAY. *Trans. Edinburgh Geol. Soc.* 10, 249-60 (1916); *Mineralog. Abstracts* 1, 58.—The field relations between basalt, shale and dolomite are described. At one locality the dolomite contains spots of kaolinite. E. F. H.

**Veining and metasomatism in basalt at Upper Whitfield, near Machiehill, Peebles-shire.** T. C. DAY. *Trans. Edinburgh Geol. Soc.* 11, 6-10 (1920); *Mineralog. Abstracts* 1, 91.—Calcite has veined and partially replaced a basalt showing pronounced spheroidal weathering. One vein contains a white fibrous form of silica, contg.  $SiO_2$  92.9 and  $Al_2O_3$  3.5%. EDW. F. HOLDEN

**Igneous intrusive phenomena at Upper Whitfield, and at Ravelrig and Kaimes Hill quarries, Belnero.** T. C. DAY. *Trans. Edinburgh Geol. Soc.* 11, 14-7 (1920); *Mineralog. Abstracts* 1, 91.—A basalt is in contact with marmorized dolomite mixed with chert, and with sandstone, where the decompd. basalt is charged with quartz grains. Two analyses of dolomite and another analysis of chert are given. E. F. H.

**Marginal intrusive phenomena near Linlithgow, and at Auchinoon.** T. C. DAY. *Trans. Edinburgh Geol. Soc.* 11, 50-3 (1920); *Mineralog. Abstracts* 1, 91.—This paper describes an "intrusion breccia," spotted clay-slates overlying dolerite, and a contact of olivine-dolerite and hornfels. The dolerite contains a green chlorite with:  $SiO_2$  29.84,  $Fe_2O_3 + Al_2O_3$  43.30,  $MgO$  13.07,  $H_2O$  10.89%. EDW. F. HOLDEN

**Descriptions of some volcanic vents near St. Andrews.** D. BALSLIE. *Trans. Edinburgh Geol. Soc.* 11, 69-80 (1920); *Mineralog. Abstracts* 1, 91.—The rocks in six

volcanic vents are much decomposed. In a bomb of olivine-basalt, *bombyxite*, a hydrous Mg-Al silicate, was found. EDW. F. HOLDEN

The development of orthoclase phenocrysts in the magma. A. JOHNSON. *Z. Krist.* 56, 423-4 (1921).—In magmas as in various artificial melts the first crystals to form are twinned. In the case of orthoclase the original habit seems to have been that of adularia, but as the magma cooled and the rate of deposition on different faces changed the normal habit gradually developed, one half of the twin becoming wider than the other because of peculiar deposition relations. The untwinned phenocrysts are always smaller, and may represent growth around fragments broken from twins. E. T. W.

Results of statistical studies of the chemistry of the lamprophyres. P. J. BROWN. *Z. Krist.* 56, 417 (1921).—Contrary to the opinion often held, the study of the Lausitz lamprophyres indicates that the varieties cannot be distinguished chemically, but must be separated on mineralogical and structural bases. The comps. of lamprophyres in general were studied statistically. The chem. character of individual varieties was thus established, and it was found that they fall into 3 magmatic series. Important light on magmatic differentiation was thereby obtained. E. T. W.

The flint-beds associated with the Amuri limestone of Marlborough. J. A. THOMSON. *Trans. New Zealand Inst.* 48, 48-58 (1915); *Mineralog. Abstracts* 1, 90.—Dark flint nodules show a transition from pure flint at the center to an external band of dolomite crystals. EDW. F. HOLDEN

The origin of crystalline schists, illustrated by Macedonian examples. O. H. ERDMANN-DOERFFER. *Z. Krist.* 56, 419-20 (1921).—The structural and textural features of cryst. schists have not necessarily been produced simultaneously. Parallel textures are often developed before the recrystn. takes place, as shown by actual instances described. E. T. W.

Spilosite and desmosite. L. MILCH. *Z. Krist.* 56, 424-5 (1921).—The spots and stripes of these contact-metamorphic rocks represent to a certain extent cores of unaltered rock; several occurrences which point to this conclusion are described. E. T. W.

The kinematic moment in the process of metamorphism of the Saxon Mittelgebirge. K. H. SCHREUMANN. *Z. Krist.* 56, 429-30 (1921).—The sequence of phenomena in the solidifying and metamorphism of the granulite can be recognized by equil. relations existing between or approached by the minerals. What can be seen at present is a sort of projection of different stages of the developmental process on a single plane. The granulite intrusive is more or less hybrid, containing admixed feldspathized schist and assimilation products, the differences not being due to simple differentiation. E. T. W.

Data on pleochroic haloes. B. GUDDEN. *Dissertation Göttingen* 1919; *Z. Krist.* 56, 422-3 (1921).—Pleochroic haloes around radioactive inclusions have been used to det. the age of minerals, but they can also be used to throw light on the temp. relations of the enclosing rocks. The haloes gradually disappear on warming, and it is found that this takes place according to the relation  $k = k_0 e^{-\delta/T}$ , in which  $\delta = \gamma_1 T e^{\gamma_1 T}$ ,  $k$ , signifies the difference in absorption constants between halo and mineral.  $T$  the abs. temp., and  $\gamma_1$  and  $\gamma_2$  are consts. for each mineral. E. T. W.

Rock temperatures in the coal measures of Great Britain. J. I. GRAHAM. *Colliery Guardian* 123, 1537-8 (1922).—A study of the rate of increase of temp. in the earth's crust with depth, the methods used being described in detail. The temp. observed may be over 1° lower than the true temp. of the strata, owing to cooling by escaping gases. The influence of the thickness of cover, variable cond. of the rocks, radioactivity and thermal effects from chem. reactions in the rocks are suggested to account for differences in

gradient observed from one locality to another. The heat of the strata does not contribute so much to the heat of mines as do adiabatic compression of the air and oxidation of coal.

C. C. DAVIS

Recent advances in science—geology. G. W. TYRRELL. *Sci. Progress* 17, 35-41 (1922).—Sections are devoted to recent work on the chemistry of metamorphic rocks and on volcanology.

JOSEPH S. HERBURN

Recent advances in science—mineralogy. ALEXANDER SCOTT. *Sci. Progress* 17, 41-6 (1922).—Review of recent work in mineralogical chemistry. JOSEPH S. HERBURN

The crystal structure of periclase (SCHIEBOLD) 2. The structure of alum (VALERON) 2. Base exchange in silicates (RAMANN, SPENGLER) 6. Use of Röntgen rays in the investigation of minerals in powder form (AMINOFF) 3. North American copper mines (SUMMERSBACH) 9.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Synthetic cast iron. H. KRELER. *Fonderie moderne* Nov. 1921; *Industrie chimique* 9, 310 (1922).—Synthetic cast iron is obtained by recarbonization of scrap iron and steel in an elec. furnace. Combination begins at the top of the charge and is complete at fusion at about 1200-1300°. Any desired C content can thus be obtained and the Si, Mn and P content are equal to those of the charge.

A. P. C.

Control of silicon in the blast furnace. S. L. GOODALE. *Blast Furnace & Steel Plant* 10, 274-8\*387-70 (1922).—The various forms in which Si is present in cast iron are outlined and the effects of variable amts. of Si at different temps. are discussed. Special emphasis is laid on the effect of the Si on the graphitic C in cast iron and the control of this state. The influence of Mn and S on the C pptn. also is taken up in connection with the Si. The shrinkage of cast iron and also the m. ps. of cast iron of different C contents are taken up.

W. A. MUELLER

A direct method for steel manufacture. A. E. BOURCOUD. *Iron Age* 109, 1349-51 (1922).—The aim of direct processes for the manuf. of steel is economically to reduce Fe ore to sponge and to convert the sponge on an industrial scale into either malleable Fe or steel. The reduction to sponge is the step that it has been found most difficult to carry out commercially. Efficient reduction by gases involves the generation of the gases and a method of applying them efficiently. The first point is solved by the generation by a new method of reducing gases from fuel in its atomized or pulverized form. The second point is solved by the design of a spiral-wall rotary furnace which causes the gases to impact on the ore continuously. The sponge produced by this furnace is continuously compressed and delivered to an elec. melting furnace.

LOUIS JORDAN

Sulfur in siderurgy. ERNESTO BLANCHI. *Giorn. chim. ind. applicata* 4, 254-60 (1921).—Monograph and review. The following generalizations are made: (1) The bases contained in slags do not constitute a desulfurizing agent that is practical and of sufficient activity. (2) The only reagents sanctioned up to now by practice as suitable for desulfurizing are: O during the oxidizing period of refining, and Mn in any case but especially during the reducing period. (Ca and Mg, etc., may be active desulfurizing agents, perhaps superior to Mn, but they still demand practical industrial proofs.)

R. S. P.

The behavior of zinc blende and barytes in the blast roasting of lead ores. C. DÖRSCHNER. *Metall u. Erz.* 19, 29-38, 57-64 (1922).—Barytes presents no difficulties to blast furnace roasting either in pure or zinc-bearing lead ores. In the roasting expts. little or no decompn. of the barytes took place. Nevertheless the desulfurization in

blast roasting of ore with a large content of barytes is sufficient so that the total S content in the roasted product is no higher than with ores free from barytes. Since a part of the S is present as barytes, the roast product contains less sulfide and lead and zinc sulfates, which is an advantage in the further treatment in the blast furnace. Ores which, like Rammelsberg ore, have a large content of barytes inter-grown with the sulfide, have a structure which is particularly good for blast roasting. They require no basic additions since the barytes fulfill their purpose of sepg. the easily melting sulfide particles. Lead ores which contain zinc blende allow the time to be shortened for thorough roasting. There is also a better desulfurization than with pure lead ores. As a basis for this it is to be noted that zinc blende sinters with the slag formers more difficultly than lead sulfide. The total S content of the roast product of zinc-bearing lead ores averages 2.4% in comparison to 3.7% for pure lead ores. In the roasting of zinc-bearing lead ores a higher temp. is reached. Up to a certain degree this does no harm. A too high temp. in the converter causes a sulfatizing of the blende and thereby hinders the blast. In the roasting of Rammelsberg ores no zinc loss takes place and the lead loss may be held down to the usual amt. Further, it is possible to blast roast a pure Clausthal zinc blende with S content of 11-14.5% S with the addition of lime and sand.

R. S. DEAN

North American copper mines. BRUNO SIMMERSBACH. *Wärme- u. Kälte-Technik* 24, 70-2(1922).—A review of the mode of occurrence of copper, and its industrial development, in the United States.

ERNEST W. TRIBLE

Treatment of low grade copper ores containing lime and magnesite by wet methods.

A. S. SCHORR. *Metall u. Erz.* 19, 85-92, 140-52(1922).—Two processes are discussed, ammonia leaching and cyanide leaching. For ammonia leaching the best soln. is  $(\text{NH}_4)_2\text{CO}_3$  contg. 50-70% free  $\text{NH}_3$ . The soln. should contain about 2%  $\text{NH}_3$ . Sulfide ore must be previously roasted but the ignited  $\text{CuO}$  is not as sol. as oxidized ores. The Cu is sepd. from the ammoniacal soln. by distn. of the  $\text{NH}_3$ , whereby  $\text{CuO}$  is obtained and the distillate may be reused. Cyanide soln. is a good solvent for malachite and cuprite. The Cu must be sepd. electrolytically and the regeneration of the leaching soln. is only to a slight extent possible. In general cyanide leaching is not commercially feasible when the price of cyanide is greater than that of Cu.

R. S. DEAN

Copper leaching at Whim Well, West Australia. H. R. SLEEMAN. *Mining Mag.* 27, 19-22(1922).—Cf. C. A. 16, 2659, 2831.

A. BUTTS

A new method of treating surface residues for gold. ANON. *S. African Mining Eng. J.* 33, 1065-6(1922).—At the May Consolidated mine, S. Africa, old dump material is run over special tables covered with gunny sacks, to which heavy material adheres. A concentrate contg. the Au is thus obtained. No amalgamated plates are used. Some of the ore has been previously worked 3 times by other methods, but still contains \$10 Au per ton, of which \$7.50 is recovered.

A. BUTTS

The recovery of precious metals from photographic and other trade-waste solutions. E. GARDNER. *J. Soc. Chem. Ind.* 41, 285-7R(1922).—Spent solns. from photographic processes may be collected in a wooden vessel and the precious metals pptd. with clean scrap iron. Reduction is complete in 24 hrs. and the ppt. settles completely. Two tanks may be employed so that one is charged and the metals are pptd. while the ppt. is settling in the other. For recovery, the ppt. is passed with water through a sieve 6-mesh to the inch, drained on a calico filter and washed with hot water. The cloth and ppt. are dried at a gentle heat. Paper cuttings, spoiled prints, etc., may be recovered by incinerating the material and adding the ashes to the ppt. from the waste solns. Waste cyanide solns. should be heated with Zn dust with frequent stirring whereby the precious metals are slowly but completely pptd. Neutral or slightly acid Ag solns. other than cyanide should be acidified and pptd. as chloride, which may be sent to the refinery or

reduced to metallic Ag with scrap Fe. Pt is best recovered by electrolytic reduction, an insol. anode being used. Directions are given for making the calico filters. The ppts. should be shipped to the refinery in well made wooden boxes or jars of glass or earthenware.

W. H. BOYNTON

Heat treatment progress during 1921. A. E. WHITE. *J. Ind. Eng. Chem.* **14**, 807(1922).

E. J. C.

Distribution of temperature in steel ingots during cooling. S. SAITO. *Sci. Repts. Tohoku Imp. Univ.* **10**, 305-30(1921); *Science Abstracts* **25A**, 245-6.

H. G.

The corrosion of iron and steel. T. S. FULLER. *Gen. Elec. Rev.* **25**, 425-7(1922).

—A short review of the various theories advanced.

C. G. F.

The corrosion of ferrous metals. J. N. F. *Nature* **110**, 83-4(1922).—A review.

W. H. ROSS

The influence of blow holes in thin plates on their rusting. O. BAUER. *Mill. Materialprüfungsamt* **37**, 1-11(1919).—By a method used previously by B. (C. A. **11**, 1753) the heat cond. and rusting action of Fe plates 0.3 mm. thick contg. blow holes and blisters were investigated. It was found that (1) blow holes and blisters retard the passage of heat through the plates, and can cause a difference of 20° with a source of heat at 100° as measured by the thermoclement; (2) temp. differences of 20° cause noticeable, though small, differences in potential whereby warm plates become less noble than cold ones; (3) warm plates in contact with cold plates rust more readily than when not in contact (cf. C. A. **13**, 2187). The rusting action is not evident however at the blisters, but in the regions adjacent to the blisters. The blister-free metal is more actively attacked than either the regions farther from the blisters or at the blisters themselves. The local corrosion by rusting can therefore hardly be traced to local difference in temp. in boiler tubes (cf. Heyn, *Stahl und Eisen*, No. **10**, 595(1906)).

C. C. DAVIS

Cast nickel-chromium alloys. E. F. LAKE. *Foundry* **50**, 452-4; *Brass World* **18**, 158-61, 165-7(1922).—Manuf. of alloys by the Hoskins mfg. Co., Detroit, is described. Three alloys are made, viz.: Ni 80, Cr 20%; Ni 85, Cr 15%; and Ni 64, Cr 11, Fe 25%. The alloys are used for castings, pyrometer couples or resistance ribbons. Impurities of all kinds, if present in more than traces, lower the resistance of the alloy to electricity, heat, oxidation and corrosion. The metals are melted in induction, arc and crucible elec. furnaces. Occluded gases are harmful in melting.

V. O. HOMERBERG

Electric arc welding in steel structures. J. CALDWELL. *Engineering* **113**, 88-90(1922).

H. G.

Refractory material for zinc retorts (U. S. pat. 1,424,120) **19**. Pyrometers, etc. (Brit. pat. 177,149) **1**.

DESCH, C. H.; *Metallography*. 3rd Ed. revized. London: Longmans, Green & Co. 440 pp. 18s. Reviewed in *Chem. Age* (London) **6**, 792(1922) and *Chem. News* **125**, 9(1922).

GORRENS, PAUL: *Einführung in die Metallographie*. Halle a. S.: Wilhelm Knapp. 344 pp. M 106 bound.

HADFIELD, ROBERT A.: *Work and Position of the Metallurgical Chemist*. London: Charles Griffin & Co. Ltd. Reviewed in *J. Roy. Soc. Arts* **70**, 582(1922).

HALL, JOHN HOWE: *The Steel Foundry*. New York: McGraw-Hill Book Co. 334 pp. \$4. Reviewed in *The Foundry* **50**, 555(1921).

"Hütte," *Taschenbuch für Eisenhüttenleute*. 2nd Ed. Edited by Hanemann. Berlin: Wilhelm Ernst & Son. 963 pp. M 738. Reviewed in *Chem. Met. Eng.* **27**, 178(1922).



**Metalltechnischer Kalender, 1922.** Edited by W. Guertler. Berlin: Gebrüder Borntraeger. 134 pp. M 45. Reviewed in *Metal Ind.* 20, 275(1922) and *Z. Metallkunde* 14, 226(1922).

**Sexton, A. Humboldt:** *An Elementary Textbook of Metallurgy.* 6th Ed. revised and enlarged by C. O. Bannister. London: Chas. Griffin & Co. 8s. 6d. Reviewed in *Chem. News* 124, 386(1922).

**Concentrating ores, etc.** F. ONDRA. Brit. 177,615, Jan. 4, 1921. Powdered minerals are formed, together with a fluid, which may be water or air, into a freely projected jet, the material is collected in sep. portions according to its tendency to fall out of the jet under the influence of gravity, and afterwards each portion is sepd. according to size. A suitable app. is specified.

**Concentrating sulfur ores.** T. R. SIMPSON and MINERALS SEPARATION, LTD. Brit. 177,839, Dec. 2, 1920. S is sepd. from its ores by flotation for forming a pulp of the powdered ore, and subjecting the pulp to agitation and to aeration from below without the addition of a frothing or modifying agent. The S is obtained in the froth. Cf. 10,312, 1914 (*C. A.* 9, 2760) and 155,349.

**Ore concentrator.** W. C. McCoy. U. S. 1,423,130, July 18. The ore is passed over an oscillating table immersed in  $H_2O$  or other liquid.

**Ore-sizing apparatus.** W. S. BROWN. U. S. 1,423,751, July 25.

**Apparatus for separating and classifying ores or similar materials by fractional sedimentation.** L. H. FALLEY. U. S. 1,422,092, July 11.

**Apparatus for separating ore constituents from solutions by settling.** A. J. ARBUCKLE. U. S. 1,422,514, July 11.

**Hydraulic ore separator.** E. R. BROWN. U. S. 1,422,736, July 11.

**Magnetic separator.** TSUNESABURŌ UMEHARA, TETSUO KUME, YOSHIRO NAKAGURO, and the SOUTH MANCHURIAN RAILWAY Co. Japn. 39,608, Aug. 19, 1921. Spiral wings made of magnetizable metals are fixed around a horizontal shaft enclosed in a conduit pipe made of non-magnetizable material, under which strong magnetic poles are fixed. The shaft is rotated by suitable mechanism. Materials are introduced from the top of the conduit pipe. Magnetizable metals in the sample are carried by the wings and washed with  $H_2O$ , while impurities are carried away by running  $H_2O$ .

**Disposing of smelter gases.** W. H. HOWARD. U. S. 1,422,575, July 11. Smelter gases or the like are discharged into the atm. through tall chimneys into which are also introduced sufficient heated air and combustion gases or other harmless gas so to dil. the obnoxious gas that it will be harmless when diffused in the atm.

**Smelting furnace with vertical retorts.** F. FINECHIL. U. S. 1,422,684, July 11. The furnace is adapted for smelting Zn ore.

**Roasting zinc sulfide ores.** F. W. HARBORD. U. S. 1,422,701, July 11. Complex  $ZnS$  ores or concentrates or blends are injected by an air blast against a heated surface maintained at such a temp. as to roast the material as it travels through the chamber into which it is thus injected.

**Precipitating copper or other metals from solutions.** H. BARDY. U. S. 1,423,070, July 18. Metallic salt solns. such as those contg. Cu are treated with sawdust, straw or sugar under pressure and at a temp. of above  $100^\circ$  in order to ppt. the metal.

**Pure bismuth.** AKIRA YAMADA, TORAICHI MIYAZAKI, and KATSUJI IKEDA. Japn. 39,626, Aug. 20, 1921. Ores contg. Bi are crushed into small pieces and dissolved in 5-20%  $H_2SO_4$  or  $HCl$ , preferably in the former. By adding Fe to the soln., Bi ppts. as a fine powder. It is filtered, washed with the acid and  $H_2O$ , and dried, preferably *in vacuo* or in inactive or reducing gases. It is put in a melted alkali or paraffin and heated at  $300-500^\circ$  to expel the impurities, such as As or Mo. The solvent is decanted and the

Bi poured into a mold. The product is free from As, etc. Recovery of Bi is about 96%.

**Sealing cracks in the lining of blast furnaces.** T. KENNAN. U. S. 1,423,332, July 18. The stock level in the furnace is raised above the cracked zone and the air flow is coned adjacent to and above the cracked zone to cause filling of the cracks with molten material.

**Reducing iron ores.** W. E. F. BRADLEY. U. S. 1,422,733, July 11. Finely divided Fe ore and flux are continuously passed through a rotary drum furnace and thence into an elec. furnace, where the mass is fused and treated with a reducing gas in countercurrent.

**Basic open-hearth steel.** H. C. RYDING and A. W. ALLEN. U. S. 1,423,031, July 18. A highly heated or molten complete slag consisting of lime and Fe oxide is first provided in a basic open-hearth furnace and there is then introduced a complete charge of molten blown metal which is finished with the slag in the furnace. The finished steel and slag are removed and the operation is repeated with entirely new charges of slag and metal. Cf. C. A. 15, 1132.

**Reducing ores.** W. E. F. BRADLEY. U. S. 1,422,734, July 11. Ores such as Fe oxide ores are reduced with a hydrocarbon gas and free C and Fe oxide are added to the reduced molten charge in order to regulate the C content of the finished metal.

**Plating iron with zinc.** YOSHITARÔ FUKUYA and MOSUKE HIRAYAMA. Japn. 39,593, Aug. 19, 1921. The surface of an iron plate plated with Zn is cleaned and polished by blowing  $\text{NH}_4\text{Cl}$  gas heated above  $100^\circ\text{F}$ . on to the plate while hot. The hardness of the plate is also decreased to a suitable degree by the process.

**Casting iron or similar vessels.** G. ENGEL, SR. U. S. 1,423,654, July 25. Vessels which resist chemical action are formed by casting a relatively thick outer layer of ordinary Fe in the external shape of the vessel and then casting a thinner inner layer of ferro-Si of the inner shape of the vessel within the thicker outer layer and permitting the inner thinner layer to cool before the outer thicker layer so as to cause the latter to shrink upon the inner layer.

**Ingot mold.** S. E. HITT and J. I. PEYTON. U. S. 1,422,572, July 11. The upper portion of the mold wall is provided with a vacuum chamber.

**Annealing malleable cast iron.** C. T. HOLCROFT. U. S. 1,422,710, July 11. Malleable Fe castings are annealed by a progressive regulated heating, maintained for requisite time at annealing temp. and then gradually cooled to a temp. below which rapid cooling will not have a detrimental effect.

**Silicon-manganese-chrome steel.** G. GUSTAFSON, A. A. JUNGMARKER and K. A. CASPERSSON. U. S. 1,423,847, July 25. Ferro-Mn is added to basic open-hearth steel and then a previously melted decarburized alloy of ferro-chrome and ferro-Si is added.

**Low-phosphorus pig-iron.** TOKUSHIRÔ MATSUBARA and NIPPON AEN KABUSHIKI KAISHA (the Japan Zinc Co.). Japn. 39,650, Aug. 22, 1921. The carbonization of purified pig-iron is conducted by heating with petroleum pitch, by which the introduction of P from the carbonization material is prevented.

**Carbonizing ferrous metals.** W. BONSOR. U. S. 1,422,630, July 11. Steel to be carbonized is heated with humus soil which contains less than 15% of moisture and the dry solids of which contain over 20% C and over 3% N, together with Ca compds. sufficient to supply at least 4.4% CaO.

**Iron-nickel-chromium alloy.** P. GIRIN. U. S. 1,422,096, July 11. An alloy having the qualities of good steel mechanically and highly resistant to attack by strong acids, org. acids and alkalis in soln. or fusion is formed of Fe alloyed with Ni 20-25%, Cr 10-15%, Mn 1-2% and C 0.2-0.5%.

**Alloys.** NORSKÉ MOLYBDËNPRODUKTER AKT. Brit. 177,516, March 20, 1922.

Mo alloys free from, or comparatively low in, Cr, and having improved acid-resisting magnetic, and other properties, contain also Mn and Fe, Ni, or Co; or instead of Mn they may contain Si, or Fe-Ni, or Fe-Co; W, U, V, Nb, Ta, C, Zr, Ti, B and P also may be present. Ca molybdate may be added to a steel bath to introduce the Mo. Alloys comprising (1) 60-85% of Ni, 30-35% of Cr, 2-5% of Mo, and 1% of Ag, and (2) 70% of Mo, 20% of Cr, and 10% of Cu also are referred to.

**Making brass.** P. DUTOIT. U. S. 1,423,922, July 25. Small quantities of Cu and Zn are successively introduced into a body of molten  $\text{BaCl}_2$  to melt the metal and effect sepn. of the slags formed as a superficial layer.

**Aluminium alloy.** A. MANHART. U. S. 1,422,591, July 11. A hard, non-brittle castable alloy adapted for making cast cooking vessels is formed of Al 10, Mn-Cu 1.25, Cu 2.5, and Sn 6 parts together with small amts. of Sb, Mg, K and S.

**Aluminium alloy.** F. C. FRARY. U. S. reissue 15,407, July 11. See original pat. 1,412,280, C. A. 16, 2105.

**Tungsten, gold and vanadium alloy.** C. A. LAISSE. U. S. 1,423,338, July 18. An alloy which is adapted for making elec. contact points is formed from W 84.5-99.4%, V 0-0.1%, Au 0.5-15% and small amts. of Ca.

**Electrode for arc welding.** J. CHURCHWARD. U. S. 1,423,914, July 25. Electrodes of W are used for elec. arc welding.

**Welding by thermo-aluminic processes.** H. GOLDSCHMIDT. Brit. 178,396, June 7, 1921. Addition to 157,798. In a thermo-aluminic process as described in the principal patent for welding tramway rails, girders, etc., the end faces of the parts are first preheated and thermo-aluminic iron is then run between the parts in a mold which is reduced so that the adjoining parts are not heated and so that no sep. casting-over takes place. The parts are first heated in a mold with large internal dimensions by gases produced from fuel such as benzene. The mold may be made of clay, cast iron, cast steel, or sheet metal with a refractory lining such as asbestos. When heating is effected the mold is removed and replaced by a narrower mold in which the welding is effected. This mold may be made by stamping out from mold material and then drying by placing over the pre-heating mold.

**Soldering aluminium.** H. LOWE. Brit. 176,973, Jan. 24, 1921. A solder for Al consists of Sn, Zn, and a small proportion of Sb, e. g., 75% of Sn, 20% of Zn, and 5% of Sb. The solder is applied with the aid of a flux consisting of 80% of stearic acid, 10% of  $\text{SnCl}_2$  and 10% of  $\text{ZnCl}_2$ . According to the provisional specification the Sb may be omitted.

**Cleaning aluminium.** ETABLISSEMENTS MÉTALLURGIQUES DE LA GIRONDE. Brit. 178,399, June 28, 1921. Al is cleaned at a comparatively high temp. in a bath contg. 67-70% of  $\text{H}_2\text{SO}_4$ . Alkali sulfate and  $\text{H}_2\text{O}$  are added, whereupon on cooling crystallized alum is obtained as a by-product. As an example, a bath contains 700 g. of  $\text{H}_2\text{SO}_4$  and 320 g. of  $(\text{NH}_4)_2\text{SO}_4$  to the l. and the cleaning is effected at about 105° for 18-20 min. When the bath contains not more than 40-45% of free acid  $\text{H}_2\text{O}$  is added and alum deposits on cooling. Preferably fresh  $(\text{NH}_4)_2\text{SO}_4$  is added to regenerate the bath, which can be used for further cleaning.

**Metal plate for bank vaults.** F. J. NAPOLITAN. U. S. 1,422,295, July 11. A graded aggregate of fused and crystd.  $\text{Al}_2\text{O}_3$  is embedded in cast Fe for lining "burglar-proof" vaults.

**Vault plate resistant to heat and cutting tools.** R. S. EDMONDSON. U. S. 1,423,652, July 25. Layers of fused  $\text{MgO}$  and fused  $\text{Al}_2\text{O}_3$  are embedded in a matrix of cast Fe to form plates adapted for bank vault walls.

## 10—ORGANIC CHEMISTRY

CHARLES A. ROUILLER

**Recent advances in science—Organic chemistry.** O. L. BRADY. *Sci. Progress* 17, 27–30(1922).—Review of recent work on the free  $\text{NH}_2$  radical, the nitration of toluene, and the electronic conception of org. compds. JOSEPH S. HEPBURN

**Bivalent carbon.** ALFRED GILLET. *Bull. soc. chim. Belg.* 30, 329–36(1921).—A theoretical paper in which some evidence is adduced to show the existence of certain bivalent C compds. either as unstable intermediate substances or as isomerides of differing degrees of stability. J. C. S.

**The mode of combination of atoms in carbon compounds.** I, II. HANS BRÜTLER. *Z. anorg. allgem. Chem.* 120, 24–30, 31–47(1921).—Falk and Nelson (*C. A.* 3, 1394) and Guy (*C. A.* 14, 1120) have explained the alternation of phys. properties in homologous series of aliphatic compds. as due to alternating electronic structure of the C-C bonds in question. This is rejected, because (a) the substances do not ionize; and (b) the above alternations disappear at the critical temp. B. prefers to assume that a space lattice is formed to a certain extent even in the liquid phase or in soln. On this basis the above facts are explained, and also liquid crystal formation, and the partial miscibility of liquid pairs. It is maintained that the common ions have an electron structure in the outer shell resembling the noble gases; this structure is also characteristic of the non-dissociable coordination compds. of Werner and others. Similar coordination structures applied to org. compds. explain their non-dissociation. It is further claimed that the two forms of  $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$  (A) may be explained without Werner's assumption of a planar structure, by considering the groups to be attached rigidly to the corners of a central cube. C has the coordination no. 4. C does not show the same isomerism of compds. of the type  $\text{CX}_2\text{Y}_2$  as does A (above) because C has many fewer inner electron shells than Pt, and therefore the valence directions are much less rigidly fixed. Accordingly, the structures given for C compds. (22 in no.) are held to represent only mid-positions of greatest stability. Because  $\text{CH}_4$  and  $\text{CCl}_4$  show no evidence of combination, it is held that  $\text{CH}_4$  must have a "negative exterior surface," involving closer approach of H atoms to the nucleus than shown by the cubical formula. The formulas given for the halomethanes have (electronically) "noble gas" structures. This is used to explain their non-ionization, and the very low m. p. and b. p. of  $\text{CH}_4$ . Attraction of electron pairs forming C-C unions causes the low limit-value of 0.78 for d. of aliphatic hydrocarbons. Stark's picture of double bonds (*Elektrizität im chemischen Atom* 86–7, 265) is claimed to lead not to space but to optical isomerism. It is therefore held that a double bond should be represented by an ellipse of 4 electrons; if one assumes that such an ellipse may be parallel or at right angles to the groups in question, Erlenmeyer's 4 cinnamic acids might be explained. Pascal's detns. of paramagnetism are held to confirm the theories advanced, which are also used to explain the peculiarities of conjugated double bonds, and the salt-formation of certain acetyl- enes. Aromatic structures also are discussed and illustrated to some extent.

BEN H. NICOLET

**Specific characters of hydrolytic decompositions.** S. T. J. TROMP. *Rec. trav. chim.* 41, 278–300(1922).—Since the mol. vol. and the mol. refraction are, of all the sp. characters of decompn. by hydrolysis, the most easily studied even after the reaction itself is over T. selected them for this study. Practically he was limited to substances having a low m. p. so that the d. and  $n$  could be detd. in the liquid state. When 2 or more substances combine with the elimination of  $\text{H}_2\text{O}$  the sum of the original vols. generally changes. In other words the reaction is accompanied by a contraction or by a dilatation thus:  $V = v + v' - v'' \pm \alpha$  where  $V$  is the mol. vol. of the esters or the ether,  $v$  and

$v'$  are mol. vols. of the reagents (alc., acid),  $v''$  is the mol. vol. of the compd. eliminated ( $H_2O$ ) and  $\alpha$  a correction. Berthelot found that  $\alpha = 0$  in esterification reactions. Schley found the same to be true of the triacylins. Schoorl (C. A. 14, 2100) detd. the contraction produced in the inversion of sucrose and proposed parallel detns. and calcs. in reactions in which  $H_2O$  is fixed in order to see if the contraction due to fixation is the same in analogous reactions. The sp. vol. of the mol. of  $H_2O$  fixed in the inversion of sucrose was found to be 0.67 by S. The sp. vol. of  $H_2O$  fixed varied but little for the same type of reaction but varied considerably from one type to the other. The approx. values for this sp. vol. of  $H_2O$  fixed was 1.00 for the esters, 1.45 for cyanides, 1.25 for carbylamines, 1.65 for  $NO_2$  compds., 1.08 for anhydrides, 0.77 for ethers, 1.23 for oximes, 2.00 for amides and 1.60-1.80 for acetals. The method may be used in certain cases to det. whether a compd. is a nitrite or a  $NO_2$  compd., a cyanide or an isocyanide. It was also shown that anisole and phenetole ought to be considered not as ethers but as esters of  $PhOH$  since the sp. vol. of  $H_2O$  fixed by them is 1.08. T. confirmed the ether structure of sucrose in this way. T. has also detd. in the same way whether the sp. refraction of combined  $H_2O$  as derived by calcn. differs from that of uncombined  $H_2O$ , which is 0.334 at  $15^\circ$ . The results follow: for esters 0.327, for cyanides 0.279, for  $NO_2$  compds. 0.250, for anhydrides 0.319, for ethers 0.325 (quite variable), oximes 0.243, amides 0.273, acetals 0.400. The results show that the sp. refraction is less suited for the study of chem. constitution in this way than the sp. vol. In fact the former deviate only 20% from the value 0.334 while the latter deviate 100%.

E. J. WITZEMANN

**General behavior of optically active compounds.** T. S. PATTERSON. *Sci. Progress* 17, 60-74(1922).—An exhaustive discussion of the influence exerted on the rotatory power of optically active compds. by the temp., solvent, and wave length of the light. Attention is paid chiefly to the temp.-rotation curves. JOSEPH S. HEBURN\*

**Rearrangements in the resolution of racemic substances.** RUDOLF WAGSCHIDER. *Ber.* 55B, 764-6(1922).—Pope and Peachey (*Proc. Chem. Soc.* 16, 42, 116(1900)) found that in the resolution of the *dl*-methyleneethylpropyltin base as the *d*-camphorsulfonate, only the salt of the *d*-base seps. on continued concn.; i. e., the *l*- is completely converted into the *d*-base. They explain this on the assumption that in the soln., which after partial crystn. contains an excess of the *l*-base, this excess of *l*-base is racemized on evap. further. This explanation needs to be more clearly expressed, for it is by no means always a question of a racemization in the strict sense. The rearrangement can take place in 2 ways; it is either the compds. of the optical antipodes with the active reagent which rearrange, or these compds. are partly dissociated in soln. and it is the free optical antipodes resulting from this dissociation which rearrange. Naturally, both processes can take place simultaneously. Only when the free antipodes rearrange is there a true racemization; if, on the other hand, it is the compds. which rearrange, unequal amts. must be present at equil. If the rearrangement of the compds. is rapid enough, only the compd. of one antipode crystals out; which one seps. is detd. by the fact that the ratio between the equil. concns. of the undissociated parts of the crystg. and of the non-crystg. compd. must be greater than the ratio between their solubilities. This condition can be fulfilled in various ways; the crystg. form may preponderate at equil. and the solubilities be the same or the crystg. form may even be more sol., or the cryst. form may be present in smaller amt. at equil. if its soly. is materially less than that of the non-crystg. form. If the rearrangement occurs only in the free antipodes, the ratio between the solubilities of the crystg. and non-crystg. forms must be smaller than the reciprocal of the ratio between their dissociation consts. The more difficultly sol. form, e. g., seps. when it is less dissociated than the other or when the dissociation consts. of the two are about equal, while the more sol. form may sep. if it is materially less dissociated than the other.

C. A. R.

Some retro-pinacolic transformations and the mechanism of these transformations. J. J. LEVY. *Bull. soc. chim.* 29, 878-99 (1921); cf. C. A. 15, 1497.—The dehydration of trisubstituted primary and secondary alcs., whereby unsatd. hydrocarbons are formed with migration of an alkyl or aryl, was studied with reference to the position of the resulting double bond. Of the 2 possible isomers  $RC:(CH_3)CHRR'$  and  $R_2C:CRR'$ , the latter was invariably obtained in these expts. With alcs. contg. 2 different alkyls, geometric isomerism might also be expected, depending upon which alkyl migrated. It was found that Ph migrates in preference to other groups. The use of dehydrating agents was avoided in order to preclude the possibility of rearrangement of the product. Dehydration was performed in most cases by distn. at atm. pressure. 2-Methyl-2,3-diphenyl-3-propanol (A) (16 g., from 19 g.  $PhCMe_2CHO$  and  $PhMgBr$  in  $Et_2O$  and treatment of the addition product with dil.  $H_2SO_4$ ), thick yellowish oil  $b_{15}$  185-90°,  $d_4$  1.08. Phenylurethan, from 1.0 g. A and 0.5 g.  $PhNCO$ , m. 137°. Acetate, prepd. by heating A 6-7 hrs. with excess of  $Ac_2O$ , m. 112°. Distn. of A at atm. pressure or under diminished pressure in presence of  $H_2SO_4$  gave 2-methyl-2,1-diphenyl-1-propene (B),  $b_{15}$  280-2°,  $d_4$  1.01, adds Br, decolorizes  $KMnO_4$  and is oxidized by  $CrO_3$  to  $Ph_2CO$  and  $Me_2CO$ . B results also from distn. of  $Me_2CHCPh_2OH$ . Nitroso derivative, prepd. by adding fuming  $HNO_3$  to A in  $AmNO_3$  at -10-0°, m. 116-7°. 3,3-Diphenyl-4-pentanol (C), from  $Ph_3CCH_2CHO$  and  $MeMgI$ ,  $b_{15}$  186-90°,  $d_4$  1.074. 3,4-Diphenyl-3-pentanol (D), from  $PhCHMeCOPh$  and  $EtMgI$ ,  $b_{15}$  175°,  $d_4$  1.037. C, D, and  $EtCHPhCMePhOH$  all gave on distn. 2,3-diphenyl-2-pentene,  $b_{15}$  297-9°,  $d_4$  1.04. 2,2-Diphenyl-3-butanol (E), (11 g. from 14 g.  $Ph_2CMeCHO$  and  $MeMgI$ ),  $b_{17}$  169-70°,  $d_4$  1.071. 2,3-Diphenyl-2-butanol (F), (10 g. from 14 g.  $PhCHMeCOPh$  and  $MeMgI$ ),  $b_{15}$  170°,  $d_4$  1.05. Both E and F when distd. gave 2,3-diphenyl-2-butene, m. 104-5°. This on oxidation with  $CrO_3$  gave  $PhCOMe$ . Dibromide m. 150-5°. 2,2,3-Triphenyl-3-propanol (G) (17 g. from 21 g.  $Ph_2CMeCHO$  and  $PhMgBr$ ), m. 121-2°. Acetate m. 124-5°. 1,1,2-Triphenyl-2-propanol (H) (4 g. from 10 g.  $Ph_2CHCOPh$  and  $MeMgI$ ), m. 88-7°. 1,1,2-Triphenyl-1-propanol (I), from  $PhCHMeCOPh$  and  $PhMgBr$ , m. 89°. On distn. G, H, and I all gave 1,1,2-triphenyl-1-propene, m. 89-90°, sol. in  $CHCl_3$ , ligroin and boiling  $EtOH$ . It may be prepd. also from  $MeCHClCO_2Et$  and  $PhMgBr$ . Dibromide m. 108-13°. 1,2-Diphenyl-1,1-di-p-anisyl-2-ethanol (J), from  $(p-MeOC_6H_4)_2CPhCHO$  and  $PhMgBr$ , m. 125-6°, very sol. in  $PhH$  and  $EtOAc$ , much less sol. in  $MeOH$  and ligroin. 1,1-Diphenyl-2,2-di-p-anisyl-1-ethanol (K) (4 g. from 8 g.  $(p-MeOC_6H_4)_2CHCOPh$  and  $PhMgBr$ ), m. 171-2°. Both J and K when distd. give 1,1-diphenyl-2,2-di-p-anisyl-1-ethylene, m. 153-4°, very sol. in  $PhH$  and  $EtOAc$ , less sol. in  $EtOH$  and  $MeOH$ . Its soln. in  $CHCl_3$  adds Br. A. W. DOX.

The determination of hydrogen chloride obtained by hydrolysis from organic chemical compounds. J. KLIMONT. *Chem.-Ztg.* 46, 521-2 (1922).—A weighed amt. of org. substance was heated for 30 min. on the water bath with an excess of alc. 0.5 N KOH and the excess titrated with 0.5 N HCl. The following results were obtained:  $CHCl:CHCl$  gave 14.9% or 0.39 mol. HCl.  $(CHCl_2)_2$  became  $CHCl:CCl_3$ , losing 1 mol. HCl.  $CH_2ClCHCl_2$  became  $CH_2:CCl_3$  but about 1.5 mols. of HCl were obtained, which was probably due to the presence of some  $MeCCl_3$ . Monochlorohydrin gave only 0.58 mol. HCl. Dichlorohydrin became epichlorohydrin with loss of 1 mol. HCl. Dibromohydrin gave about 20% more than the expected 1 mol. of HBr probably because the substance was old.  $CH_2ClCHClOEt$  gave 1 mol. HCl.  $CH_2ClCOMe$  became very dark if much KOH was used. With not too much KOH a little over 1 mol. HCl was obtained. Dichloroacetone behaved similarly.  $CH_2ClCO_2H$  gave 1 mol. HCl and became  $CH_3(OH)CO_2H$ .  $\alpha-C_{10}H_7Cl$  should resist the action of alkali. The sample tested did not do this but probably contained about 10% of dichloronaphthalene. Liquid  $C_{10}H_7Cl_2$  gave 0.46 mol. HCl but was probably impure. Tetra-

chloronaphthalene gave a little more than 2 mols. HCl. Bornyl chloride when pure gives no HCl. Camphene should give no HCl but the sample tested gave 5% of HCl.

W. T. H.

Some aliphatic fluorides. F. SWARTS. *Bull. soc. chim. Belg.* 30, 302-5(1921).

—The following are described: *Amyl fluoride*, a volatile, mobile liquid, m. below  $-80^{\circ}$ , b.  $62.8^{\circ}$ ,  $d_{10,4}$  0.7960,  $d_{20}$  0.7880,  $n_{\alpha}^{20}$  1.35622,  $n_{\beta}^{20}$  1.36183,  $n_{\gamma}^{20}$  1.36533. *Decyl fluoride*, a mobile liquid, which solidifies in a mixt. of alc. and solid  $\text{CO}_2$ , b. about  $183.5^{\circ}$ ,  $d_{19,2}$  0.792. *Isoamyl fluoride*, b.  $53.5^{\circ}$ . *Heptyl fluoride*, m.  $-73^{\circ}$ ;  $b_{118}$   $119^{\circ}$ ,  $d_{21}$  0.8029,  $n_{\alpha}^{21.5}$  1.38358,  $n_{\beta}^{21.5}$  1.3855,  $n_{\gamma}^{21.5}$  1.3890,  $n_{\delta}^{21.5}$  1.39358. *Octyl fluoride*,  $b_{118}$   $142.5^{\circ}$ ,  $d_{14}$  0.81200,  $d_{21}$  0.8036,  $n_{\alpha}^{14.1}$  1.3952,  $n_{\beta}^{14.1}$  1.3970,  $n_{\gamma}^{14.1}$  1.40175,  $n_{\delta}^{14.1}$  1.43565. *Cetyl fluoride* is solid at the ordinary temp.,  $b_{118}$   $287.5^{\circ}$ ,  $b_{24}$   $181^{\circ}$ ,  $d_{17,4}$  0.809. *sec-Octyl fluoride*, b.  $139.3^{\circ}$ . It is stated that  $\text{HgF}$  is preferable to  $\text{AgF}$  for the prepn. of the above, several reasons being given. The yield is diminished in each case by the formation of an ethylenic hydrocarbon and  $\text{HF}$ ; when  $\text{AgF}$  is used, this may take place in such a way that 2 mols. of the alkyl halide, contg. C<sub>n</sub>, condense to yield  $\text{C}_{2n}\text{H}_{n+1}\text{F}$ ; sometimes this represents the major reaction. The chem. properties of the substances are described; they are, in general, not so stable as the majority of org. F compds. The isoalkyl fluorides tend to decomp. into ethylenic hydrocarbons and  $\text{HF}$  on distn.; with straight-chain compds. this is not the case. The action of alkali hydroxides in aq. or alc. soln. is feeble; concd.  $\text{H}_2\text{SO}_4$  reacts in the cold with formation of  $\text{HF}$ .

J. C. S.

Preparation of amines from alcohols and ammonia. EUGENIE SMOLENSKI and KAZIMIR SMOLENSKI. *Roczniki Chem.* 1, 232-43(1921).—When the vapors of Me, Et, or Am alc. react with  $\text{NH}_3$  in the presence of a dehydrating catalyst such as alumina or kaolin at about  $300^{\circ}$ , a satisfactory yield of primary, secondary, and tertiary amines is obtained. In the case of EtOH, secondary products consisting of  $\text{C}_2\text{H}_5$  and  $\text{Et}_2\text{O}$  also are obtained. If the mol. ratio of the quantities of alc. to  $\text{NH}_3$  is about 2:1, when the temp. is kept between  $300^{\circ}$  and  $330^{\circ}$ , a good yield of  $\text{NHEt}_3$  is obtained. The total yield, after accounting for the alc. which is regained, is 53% of amine, 25% of ether, and 20% of  $\text{C}_2\text{H}_5$ . Under the same conditions,  $\text{Et}_2\text{O}$  and  $\text{NH}_3$  also give  $\text{EtNH}_2$ . Good results are obtained with aromatic compds.; thus  $\text{PhNH}_2$  and  $\text{MeOH}$  at  $350^{\circ}$  in the mol. proportion of 1:4 give toluidines and xylydines, but if the temp. is kept below  $330^{\circ}$  and 10-20% of a salt of  $\text{PhNH}_2$  is added, the yield of the homologs of  $\text{PhNH}_2$  is practically zero.

J. C. S.

Propyl and isopropyl mercury compounds. M. GORET. *Bull. sci. pharmacol.* 29, 297-305(1922).—G. prepd.  $\text{PrHgEt}$ , already described by Cahours (*Compt. rend.* 76, 233, 748(1873)). In addition  $\text{PrHgCl}$  was prepd. by adding alc.  $\text{HgCl}_2$  to a soln. of  $\text{HgPr}$ . White crystals of a disagreeable odor are produced which m.  $143^{\circ}$  after repurification in alc. The compd. is sol. in 15 parts of boiling and 22 parts cold alc.  $\text{PrHgI}$  can be made by treating  $\text{HgPr}_2$  with alc.  $\text{I}_2$  in theoretical amts. It is very sol. in  $\text{Et}_2\text{O}$ , less in  $\text{C}_6\text{H}_6$ , sol. in boiling and but little sol. in cold 95% alc., m.  $113^{\circ}$ . Propyl mercuric acetate m.  $57-58^{\circ}$ . Mercury diisopropyl can be prepd. by Frankland's method. It is a colorless, limpid liquid of d. 2.05 at  $0^{\circ}$ , with an odor more agreeable than that of its isomer, can be distd. only *in vacuo*,  $b_{25}$   $75-7^{\circ}$ . Halogen derivs. are easily prepd. The chloride m.  $97^{\circ}$  and is sol. in 12 parts of boiling and 57 parts of cold alc. The bromide m.  $98^{\circ}$  and is sol. in hot alc., cold  $\text{C}_6\text{H}_6$  and  $\text{Et}_2\text{O}$ , slightly sol. in cold alc. The iodide m.  $125^{\circ}$ , is not very sol. in cold 95% alc., easily sol. in cold  $\text{C}_6\text{H}_6$ . Light and heat induce decompn. G. also prepd.  $\text{Me}_3\text{CHHgOH}$  by treating  $(\text{Me}_3\text{CH})_2\text{Hg}$  with wet  $\text{Ag}_2\text{O}$ . From this the sulfide, cyanide and acetate being made.

F. S. HAMMETT

A mixed organo-metallic compound of aluminum. FAILLERIN. *Compt. rend.*

174, 112-4(1922).—Like Mg, Al dissolves in  $\text{CH}_2\text{I}_2$  in dry  $\text{Et}_2\text{O}$ , supposedly forming  $\text{CH}_2\text{:AlI}$  (A); as a side-reaction, some  $\text{C}_2\text{H}_4$  is formed.  $\text{H}_2\text{O}$  and alc., but not  $\text{NH}_3$ , evolve  $\text{CH}_4$  from solns. of A.

BEN H. NICOLET

The isonitriles. III. Reaction with halogen aldehyde hydrates. M. PASSERINI. *Gazz. chim. ital.* 52, I, 432-5(1922).—The reaction occurring between isonitriles and aldehydes or ketones in the presence of org. acids leading to the formation of substituted amides of acylated  $\alpha$ -HO acids (*C. A.* 16, 555, 556) led P. to think that perhaps the addn. compd. (A),  $\text{HOCR}_2\text{OCOR}$ , is first formed and then reacts with the nitrile. Attempts to det. the role of A in the reaction between isonitriles and acetone-bisulfite compds. failed to give significant results owing to the slight soly. of the latter in org. solvents. Better results were obtained with the hydrates of halogen aldehydes (B),  $\text{HC(OH)}_2\text{R}$ . Two of the anilides of halogenated  $\alpha$ -HO acids that should be formed were obtained and are described:  $\text{R'NC} + \text{RCH(OH)}_2 \rightarrow \text{R'NHCOCH(OH)R}$ . 4 g.  $\text{PhNC}$  added with ice-cooling in small portions to 6.4 g.  $\text{CCl}_3\text{CHO} \cdot \text{H}_2\text{O}$  in  $\text{Et}_2\text{O}$  reacted violently and sepd. a sirup that crystd. partly in 2 days. 3.2 g.  $\beta$ -trichloro- $\alpha$ -lactanilide (C),  $\text{PhNHCOCH(OH)CCl}_3$ , was obtained as colorless crystals, m.  $147^\circ$ , is easily decompd. by alkalis and alkali carbonates, giving the odor of isonitrile and liberating 3 Cl atoms, but is stable toward acids. 1.5 g. C + 10 cc. concd.  $\text{HCl}$  + 5 cc.  $\text{H}_2\text{O}$  at  $80$ – $100^\circ$  in a sealed tube for 3 weeks gave 0.5 g. trichlorolactic acid (D), m.  $125^\circ$ . D was also identified by converting it into the glyoxime (Pinner, *Ber.* 17, 2001), needles, m.  $175$ – $8^\circ$ . C is not identical with the compd. with the same name obtained by Anschütz and Haslam. 2 g.  $\text{PhNC}$  added to 3.7 g. butylchloral hydrate in  $\text{Et}_2\text{O}$  did not react rapidly. On evapn. of the  $\text{Et}_2\text{O}$  4-5 days later a liquid was obtained from which 2 g. of  $\beta, \beta, \gamma$ -trichloro- $\alpha$ -hydroxyvalerylaniide,  $\text{PhNHCOCH(OH)CCl}_2\text{CHClMe}$ , sepd. in colorless refractive crystals, m.  $156$ – $8^\circ$ . Heated with  $\text{HCl}$  as with C it gives  $\beta, \beta, \gamma$ -trichloro- $\alpha$ -hydroxyvaleric acid, m.  $140^\circ$ , and  $\text{PhNH}_2$ . The Ac deriv. of E was obtained as fine needles, m.  $84^\circ$ .

E. J. WITZEMANN

Hydroferrocyanides and hydroferricyanides of the organic bases. I. W. M. CUMMING. *J. Chem. Soc.* 121, 1287-98(1922).—The salts of  $\text{H}_4\text{Fe(CN)}_6$  are usually colored and rhombohedral; they are infusible and are insol. or slightly sol. in cold  $\text{H}_2\text{O}$ ; hot  $\text{H}_2\text{O}$  decomp. them. They are not oxidized in aq. soln. by air at room temp.  $\text{NaOH}$  liberates the base. They are decompd. by acids. The salts of primary and secondary bases are decompd. by boiling  $\text{Ac}_2\text{O}$ , in some cases by  $\text{AcCl}$ . The salts of tertiary bases are not decompd. by  $\text{MeI}$ . When gently heated they change color, ultimately passing through green and blue to black. The  $\text{H}_2\text{O}$  of crystn.,  $\text{HCN}$  and the base are liberated. Whenever a strongly acidic group is present in the base no ferrocyanide is formed. Introduction of an alkyl group into the nucleus or side chain decreases the stability but a 2nd alkyl group increases the stability. The introduction of a 2nd  $\text{NH}_2$  group increases the soly. but decreases the stability. The salts were prepd. from the  $\text{HCl}$  salt of the base and a cold satd. soln. of  $\text{Na}_4\text{Fe(CN)}_6$ ; they were not recrystd. The salts were dried by suction after washing with alc. The following hydroferrocyanides are described. Unless otherwise noted they have the formula  $\text{B}_x.\text{H}_4\text{Fe(CN)}_6.2\text{H}_2\text{O}$  or  $\text{B}.2\text{H}_4\text{Fe(CN)}_6.2\text{H}_2\text{O}$ . Aniline, colorless with slight green tinge. *o*-Toluidine, light green needles with  $1\text{H}_2\text{O}$  or dark green rhombic crystals with  $2\text{H}_2\text{O}$ . *m*-Toluidine, dark olive-green needles. *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$  does not give a salt and this may be used as a method for sepg. the *o*- and *p*-derivs. *p*-Xylydine, lemon-yellow.  $\alpha$ -Phenylethylamine, colorless. Benzylamine, greenish yellow, turning blue on standing with evolution of  $\text{HCN}$ . *o*-Anisidine, green, but turns white on heating.  $\alpha$ -Naphthylamine, colorless plates, turning violet on standing.  $\beta$ -Naphthylamine, colorless needles, turning pink on standing. Heavy green fumes were evolved on igniting the salt and yellow needles, m.  $284^\circ$ , sublimed. Phenylenediamine; *p*-salt, white plates;



*m*-salt, yellow, diamond plates; *o*-salt, prismatic needles. 2,4-Tolylene-diamine, yellow-white, rhombic needles, crystg. from H<sub>2</sub>O in green prisms. Dimethyl-*p*-phenylenediamine, hexagonal plates. Benzidine, rhombic, slightly decompd. by AcCl. *o*-Tolidine, more sol. than the benzidine compd. and decompd. by AcCl. *o*-Dianisidine, pale blue needles. Methyl-aniline, rectangular prisms with 2, 3 and 4H<sub>2</sub>O of crystn. Dimethyl-aniline, prisms with blue tinge. *p*-Nitrosodimethylaniline, violet, and giving a green soln. in hot H<sub>2</sub>O. When heated the salt gives off heavy orange-red vapors. Trimethyl-aniline, light green, cubic octahedrons, turning yellow on heating. Pyridine, brilliant lemon-yellow rhombohedrons. Quinoline, orange-yellow, with 0.5 H<sub>2</sub>O. The greater soly. of the C<sub>8</sub>H<sub>7</sub>N salt permits the sepn. of the C<sub>8</sub>H<sub>7</sub>N. Isoquinoline, lemon-yellow, slightly more sol. than the C<sub>8</sub>H<sub>7</sub>N salt.

C. J. WESS

Catalytic oxidation of saturated paraffin hydrocarbons and fatty acids. A. H. SALWAY AND P. N. WILLIAMS. *J. Chem. Soc.* 121, 1343-8(1922).—The oxidation of C<sub>18</sub>H<sub>36</sub>O<sub>2</sub> at 120-30° with 2% Mn stearate and O for 24 hrs. gave 5% volatile acids, consisting of 1% CO<sub>2</sub>, 2.5% HCO<sub>2</sub>H and 1.5% of higher acids; 8% H<sub>2</sub>O-sol. acids, of which 3% were volatile with steam and consisted of HCO<sub>2</sub>H, AcOH and PrCO<sub>2</sub>H, while the remaining 5% were dibasic acids of the CH<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub> series (brassylic acid?). The main product of the oxidation (83%) consists of HO-acids and their lactones, none of which was obtained in pure condition. Hexadecane, oxidized under similar conditions, gave 4% volatile substances (CO<sub>2</sub>, HCO<sub>2</sub>H and AcOH), and acidic substances consisting of a pale yellow oil with neutralization value of 241, I value of 0.7,  $d_{20}^{20}$  0.9611, C 64.4, H 11.5%. 20% of the mixt. was volatile without decompn., and corresponded with hexoic to nonoic acids. The others were lactonic acids which were not studied.

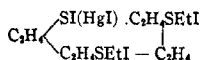
C. J. WESS

The maximal stability of carboxylic esters. K. G. KARLSSON. *Z. anorg. allgem. Chem.* 119, 69-96(1921).—v. Euler and Laurin (*C. A.* 14, 2344) have discussed their hydrolysis data on EtOAc (A) from the point of view that A is amphoteric, and has (v. Euler and Svanberg, *C. A.* 16, 2248)  $K_a = 10^{-10}$  and  $K_b = 10^{-10}$ . The neutral salt effect should accordingly show itself in a shift of the isoelectric point, because of the difference in action of the salt on the acid- and alkali-ester compds. To test for such a shift, hydrolyses were carried out at different  $p_H$  for A, and for MeOAc alone and with 0.5 N KNO<sub>3</sub> or NaCl present. In all cases quartz tubes were used, a buffer (0.02 N NaOAc) was added, and temps. were 75.4° or 85.5°.  $K$  shows a max. in the resp. cases at  $p_H = 5.1, 4.8, 4.7$  and  $4.7$ . The alk. side of the curve is steeper than the acid side, although this should not be the case if  $K = a([H^+] + b[OH^-])$ . The results are however confirmed by recalcn. of the work of Wijs (*Z. physik. Chem.* 11, 492; 12, 514 (1893)). It is concluded that neutral salts uniformly increase  $K$ , even in alk. soln. The constancy of the effect of a given salt is however proved only up to  $p_H$  4.65.

B. H. NICOLLET

Erucic acid and its anhydride. III. D. HOLDS AND C. WILKE. *Z. anorg. Chem.* 35, 289-91(1922); cf. *C. A.* 16, 1564, 2306.—Erucic acid (A), m. 34°, with an I no. of 69.7-70.6, was prepd. by hydrolysis of the fractionated Me esters of rape-oil, which were obtained by the method of Grün and Janko (*C. A.* 16, 1564, 2306). The low I no. indicated the presence of about 5% of unsatd. acids. By fractional ptn. of the Li salts of A prepd. as above fatty acids, m. 52-63°, were obtained, together with nearly pure A, m. 34-4.8°, with an I no. of 74.1-74.3. Pure A was converted to erucic anhydride (B), snow-white plates or needles, m. 46.0-6.5°, with an I no. of 76.3,  $n_D^{20}$  1.4562, by heating with Ac<sub>2</sub>O in a sealed tube at 170° for 7 hrs. (cf. *C. A.* 16, 56). B was hydrolyzed to A by boiling 1.2 hrs. with H<sub>2</sub>O. Cold 0.1 N NaOH did not sapon. B; 0.1 N alc. KOH partly converted B to the ethyl ester of A,  $n_D^{20}$  1.4558,  $d_{17}$  0.865. Alc. pyridine also partially esterified B. B was not decompd. by cold dil. HCl. Refluxing with abs. alc. converted B partly to its Et ester and partly to the free acid. T. S. CARSWELL.

**Trimethylene tri- and tetrasulfides. II.** P. C. RAY. *J. Chem. Soc.* **121**, 1279–83 (1922); cf. *C. A.* **14**, 3641.—The action of  $\text{Hg}(\text{NO}_3)_2$  on  $(\text{C}_2\text{H}_5)_3\text{S}_2$  gave the *sulfonium derivative*  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot 2\text{Hg}(\text{NO}_3)_2$ , pale yellow, which evolved red fumes with  $\text{HCl}$ . Heated with  $\text{EtI}$  for 3–4 hrs., the compound  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{HgI}_2\cdot 2\text{EtI}$ , is formed, needle-shaped gray crystals, m.  $128^\circ$ . The  $\text{AcMe}$  filtrate from this product, mixed with  $\text{MeOH}$ , and evapd. spontaneously, gave the compound  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{HgI}_2\cdot \text{EtI}$ , leaflets, m.  $86^\circ$ .  $\text{HgCl}_2$  gave the compound  $\text{C}_6\text{H}_{13}\text{Cl}_2\text{S}_2\text{Hg}$ .  $\beta$ - $(\text{C}_2\text{H}_5)_3\text{S}_2$  and  $\text{HgCl}_2$  gave the compound  $(\text{C}_2\text{H}_5)_4\text{S}_4\cdot 1.5\text{HgCl}_2$ , while the  $\delta$ -deriv. gave the compound  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{HgCl}_2$ . The  $\beta$ -deriv. and  $\text{EtI}$  gave the compound  $[(\text{C}_2\text{H}_5)_3\text{S}_4]\cdot \text{EtI}$ , m.  $103^\circ$ ; the  $\gamma$ -deriv., the compound  $[(\text{C}_2\text{H}_5)_3\text{S}_4]\cdot \text{EtI}$ , m.  $96^\circ$ , and  $[(\text{C}_2\text{H}_5)_3\text{S}_4]\cdot \text{EtI}$ , m.  $70^\circ$ ; while the  $\delta$ -deriv. gave the compound  $\text{C}_6\text{H}_{13}\text{HS}_2\cdot \text{EtI}$ , to which no definite constitution could be assigned.  $(\text{C}_2\text{H}_5)_3\text{S}_2(\text{SH})_2$  and  $\text{Hg}(\text{NO}_3)_2$  gave the corresponding *mercury nitrite mercaptide*,  $(\text{C}_2\text{H}_5)_3\text{S}_2(\text{HgNO}_2)_2\cdot 2.5\text{H}_2\text{O}$ , which, with  $\text{EtI}$ , gave 2 compounds, m.  $107\text{--}8^\circ$ , and m.  $118^\circ$ , which may be



The reaction of  $\text{HSC}_2\text{H}_4\text{SK}$  and  $\text{Hg}(\text{NO}_3)_2$  gave the compound  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{Hg}(\text{NO}_3)_2$ . With  $\text{EtI}$  this yields 3 distinct *sulfonium derivatives*:  $(\text{C}_2\text{H}_5)_3\text{S}_4\cdot 2\text{HgI}_2\cdot 2\text{EtI}$ , the least sol. part in  $\text{AcMe}$ , yellow, m.  $151^\circ$ , and the most sol. part, m.  $107^\circ$ ; the intermediate fraction had the compn.  $(\text{C}_2\text{H}_5)_3\text{S}_4\cdot \text{HgI}_2\cdot 2\text{EtI}$ , m.  $121^\circ$ .  $\text{PtCl}_4$  and  $(\text{C}_2\text{H}_5)_3\text{S}_2$  gave 2 distinct *chloroplatinates*,  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{PtCl}_4$ , pale yellow, and  $(\text{C}_2\text{H}_5)_3\text{S}_2\cdot \text{PtCl}_4$ , the former being less sol. in  $\text{EtOH}$ .

C. J. WEST

**Synthesis and properties of a  $\delta$ -hydroxyaldehyde.** BURCKHARDT HELFERICH AND THEODOR MALKOMES. *Ber.* **55B**, 702–8(1922); cf. *C. A.* **14**, 1833.—By the synthesis of  *$\delta$ -hydroxy $\gamma$ -capronaldehyde* (A) it has been shown that this compd., like the  $\gamma$ -HO aldehydes previously investigated, is stable chiefly in the cyclo-form, *2-methyl-6-hydroxytetrahydropyran*,  $\text{HOCH}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CHMe}\cdot\text{O}$ , but is easily converted in

various reactions into the oxo-form,  $\text{OHCCH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{OH})\text{Me}$ .  $\delta$ -Hexenic acid (B) was prepd. essentially according to Wallach (*Ann.* **312**, 190(1900)), the rearrangement of the cyclohexanone oxime into the  $\epsilon$ -aminocaproic lactam being carried out with only 2-g. portions of the oxime, as otherwise the reaction may easily become too violent; the yields from 100 g. cyclohexanone were 114 g. oxime, 91 g. lactam and 20 g. B; the distn. residue from the B, heated with sirupy  $\text{H}_3\text{PO}_4$ , yielded as a by-product  $\epsilon$ (?)*-capronic lactone*,  $b_{12}$   $90\text{--}100^\circ$ .  $\delta$ -Hexenyl chloride (41 g. from 50 g. B heated to  $35^\circ$  in the course of 0.5 hr. with 2 parts  $\text{SOCl}_2$ ),  $b_{17}$   $49^\circ$ ,  $d_4^{15}$  1.0113,  $n_D^{18}$  1.4471, mobile liquid of penetrating and very unpleasant odor, quickly decompd. by cold  $\text{H}_2\text{O}$ ; 30 g. in 350 cc. cold  $\text{Et}_2\text{O}$  slowly treated, with shaking or stirring and carefully protected from moisture, with 33 g.  $\text{MeI}$  and 6 g.  $\text{Mg}$  in 160 cc.  $\text{Et}_2\text{O}$  and at once decompd. with ice gives about 48% of *methyl  $\delta$ -amylenyl ketone*,  $b_{10}$   $41\text{--}3^\circ$ ,  $d_4^{15}$  0.8673,  $n_D^{18}$  1.4350, liquid of unpleasant odor; *semicarbazone*, needles from  $\text{EtOH}\cdot\text{H}_2\text{O}$ , m.  $108^\circ$ . *Methyl- $\delta$ -amylenylcarbinol* (22 g. from 30 g. of the ketone reduced as described in the earlier paper),  $b_{12}$   $64\text{--}5^\circ$ ,  $d_4^{15}$  0.8484,  $n_D^{19}$  1.4387, liquid of a resinous odor and taste, gives with  $\text{O}_3$  as previously described 65% A,  $b_{11}$   $71\text{--}8^\circ$ ,  $d_4^{15}$  1.0065,  $n_D^{18}$  1.4452, mol. wt. in freezing  $\text{H}_2\text{O}$  116.8, moderately mobile liquid of resinous odor and taste, sol. in 25 parts  $\text{H}_2\text{O}$ , reduces boiling Fehling soln., in 1% soln., about 0.1 as strongly as glucose, gradually colors fuchsin- $\text{SO}_2$  to about the same intensity as an equiv. soln. of  $\text{AcH}$ , only slowly reduces Tollens soln. (the reaction is complete only after about 1.5 hrs. at room temp.), gives with cold concd.  $\text{NaOH}$  a white cryst. ppt. quickly changing on standing or gentle warming into dark resinous products, is very quickly discolored by concd.  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$ , apparently does not react with  $\text{NH}_4\text{OH}$ , gives with phloroglucinol and concd.

C. A. R.

C. A. R.

**Formation of osazones.** MARC H. VAN LAER AND R. LOMBAERS. *Bull. soc. chim. Belg.* 30, 296-301(1921).—A study of the formation of the osazones of levulose and dextrose shows that the difference in the time of the reaction has its origin at the

second stage and is due to the fact that the oxidation by the second mol. of  $\text{PhNHNH}_2$  is, in the first case, that of a primary alc. and, in the second, that of a secondary one.

J. C. S.

**Asymmetric synthesis.** J. PIRAK. *Biochem. Z.* 130, 76-9(1922).—P. was unable to produce asym. synthesis of lactic acid from the action of  $\text{NaHSO}_3$  on  $\text{AcH}$  under the influence of circularly polarized light.

F. S. HAMMETT

**The metal compounds of the enol forms of carbonyl compounds and their use for syntheses.** II. Synthesis of vinylideneglycol diethyl ether (ketene acetal), a contribution towards the elucidation of the course of the reaction in the acetoacetic ester synthesis. HELMUT SCHREIBLER AND HEINRICH ZIEGNER. *Ber.* 55B, 789-803 (1922); cf. *C. A.* 14, 2931.—It was shown in the earlier paper that  $\text{AcOEt}$  in  $\text{Et}_2\text{O}$  can easily be converted by means of K into the salt  $\text{CH}_2\text{:C(OEt)OK}$ , of the enolic form of the ester, and that this salt reacts with alkyl and acyl halides and with  $\text{C:O}$  compds., especially carboxylic esters, giving, e. g.,  $\text{AcCH}_2\text{CO}_2\text{Et}$  with  $\text{AcOEt}$  in  $\text{Et}_2\text{O}$ . With  $\text{PrCO}_2\text{Et}$  there are obtained  $\text{PrCOCH}_2\text{CO}_2\text{Et}$ ,  $\text{EtCHAcCO}_2\text{Et}$ ,  $\text{AcCH}_2\text{CO}_2\text{Et}$  and perhaps also  $\text{EtCH(COPr)CO}_2\text{Et}$ , and the same results are obtained with the K salt of  $\text{PrCO}_2\text{Et}$  and  $\text{AcOEt}$ , so that in the condensation of 2 different esters it is immaterial which of the two is first converted into the K salt and therefore in these condensations there must be a mutual interchange of the metallic atoms between the ester mols. and after adding the 2nd ester there is present a mixt. of the metal compds. of both esters and of both free esters. If, however, one of the esters cannot react in the tautomeric enolic form because the C atom adjacent to the ester group has no H attached directly to it (as in  $\text{BzOEt}$ ), then only a single condensation product is formed in the reaction; thus,  $\text{CH}_2\text{:C(OEt)OK}$  and  $\text{BzOEt}$  give  $\text{BzCH}_2\text{CO}_2\text{Et}$  as the sole  $\beta$ -ketonic ester. Just as in the Geuther  $\text{AcCH}_2\text{CO}_2\text{Et}$  synthesis, so here also only a fraction of the calcd. amt. of  $\beta$ -ketonic ester is formed. On decompn. of the product with mineral acids, a part of the original ester is always regenerated and considerable amts. of the free acid are formed. This cannot be due to sapon. for the condensations were carried out in  $\text{Et}_2\text{O}$  at room temp. and the decompns. effected in the cold. The clue to this reaction is found in the action of  $\text{BzOEt}$  on  $\text{CH}_2\text{:C(OEt)OK}$ ; in this case  $\text{BzOK}$  soon began to sep. from the  $\text{Et}_2\text{O}$  soln. and in the  $\text{Et}_2\text{O}$  was found an unsatd. substance which proved to be *ketene acetal or vinylideneglycol diethyl ether* (A),  $\text{CH}_2\text{:C(OEt)}_2$ . The formation of the condensation product and its decompn. may therefore probably be represented as follows:  $\text{CH}_2\text{:C(OEt)OK} + \text{BzOEt} \longrightarrow \text{BzCH}_2\text{C(OEt)}_2\text{OK} \longrightarrow \text{A} + \text{BzOK}$ . As in these expts. other higher boiling unsatd. compds. were also formed, probably as the result of hydrogenation,  $\text{NaNH}_2$  was substituted for K:  $\text{AcOEt} + \text{NaNH}_2 = \text{CH}_2\text{:C(OEt)ONa} + \text{NH}_3$ .  $\text{BzOEt}$  did not react with the finely powdered  $\text{NaNH}_2$  under  $\text{Et}_2\text{O}$  but when  $\text{AcOEt}$  was slowly added,  $\text{NH}_3$  was at once evolved violently and after heating several hrs. on the  $\text{H}_2\text{O}$  bath to complete the reaction the insol. product was found to consist of  $\text{NaOBz}$ ,  $\text{NaOAc}$  and  $\text{BzNH}_2$  while the  $\text{Et}_2\text{O}$  contained A. The spontaneous decompn. of the condensation product in the  $\text{Et}_2\text{O}$  soln., however, is never complete even after a long time and the  $\text{Et}_2\text{O}$  cannot be replaced by a higher boiling solvent ( $\text{C}_6\text{H}_6$ ), for under such conditions resinification results on long warming. The decompn. can be smoothly effected, however, if the condensation product, completely freed from the solvent, is treated with  $\text{H}_2\text{O}$ ; in this case it is no longer necessary to use  $\text{BzOEt}$  as the 2nd component, nor, in fact, is  $\text{Et}_2\text{O}$  necessary as a solvent; an excess of  $\text{AcOEt}$  is just as satisfactory. After completely evap. off the excess of  $\text{AcOEt}$  *in vacuo* the condensation product,  $\text{AcCH}_2\text{C(OEt)}_2\text{ONa}$ , is obtained as a white, odorless, not especially hygroscopic powder, which dissolves in 0.5 part  $\text{H}_2\text{O}$  with a slight evolution of heat and after several hrs.  $\text{NaOAc}$  crysts. out; extn. of the  $\text{H}_2\text{O}$  soln. with  $\text{Et}_2\text{O}$  and fractionation of the ext. yields pure A. A is quite stable towards alkalis even on

heating, but mineral acids, even at great diln., easily decomp. it into AcOEt and EtOH; it decolorizes  $\text{KMnO}_4$  in soda and Br in  $\text{H}_2\text{O}$  or  $\text{CCl}_4$ . In view of the above results, it is believed that in the  $\text{AcCH}_2\text{CO}_2\text{Et}$  synthesis the product of the action of Na or  $\text{NaNH}_2$  on AcOEt likewise has the structure  $\text{AcCH}_2\text{C}(\text{OEt})_2\text{ONa}$ . A (12 g. from 25 g.  $\text{NaNH}_2$  and 150 g. AcOEt), b.  $77.5-8.0^\circ$ , Zeiss refractometer reading  $60^\circ 25'$ ,  $61^\circ 15'$ ,  $63^\circ 9'$  for  $\alpha$ , D and  $\beta$  at  $21^\circ$ ,  $d_{20} 0.7938$ , is easily sol. in all solvents, including  $\text{H}_2\text{O}$ , easily volatile, especially with  $\text{Et}_2\text{O}$  vapors, has a faint ether-like odor, quickly reacts in  $\text{Et}_2\text{O}$  with alkali metals and alkali amides, evolving  $\text{NH}_3$  in the latter case and yielding a salt; when this is decompd. with  $\text{H}_2\text{O}$  the soln. in a few min. reduces  $\text{NH}_4\text{-AgNO}_3$  with mirror formation.

C. A. R.

**Influence of substituents on the formation and stability of heterocyclic compounds.**  
I. Hydantoins. C. K. INGOLD, SHINICHI SAKO AND J. F. THORPE. *J. Chem. Soc.* 121, 1177-98(1922).—The hypothesis has recently been advanced that the disposition of atoms around a central C atom is detd. by their relative vols. Formulas are now given connecting the angle between the C atoms and the ratio of the at. vols., and groups are compared which show that each of the formulas presented sets up the same identical scale of values by means of which the angle  $2\theta$  can be connected with quant. expl. data. The rate of fission of 6 hydantoins has been studied, the value of  $k'$  decreasing with a decrease in the value of  $2\theta$ . The relation between  $\log_{10} k'/(2\theta - 110.7)$  in every case is close to 0.20. The values found were (in order of  $2\theta$ ,  $k'$ , and  $\log_{10} k'/(2\theta - 110.7)$ ): cyclopropanespirohydantoin, 116.9, 13.8, 0.18; hydantoin, 115.3, 11.2, 0.22; cyclobutanespirohydantoin, 113.0, 2.63, 0.18; methylhydantoin, 112.5, 2.28, 0.20; dimethylhydantoin, 109.5, 0.551, 0.21; diethylhydantoin, 107.0, 0.146, 0.22. *Ethyl cyclopropane-1-carboxamide-1-carboxylate*,  $(\text{CH}_3)_2\text{C}(\text{CONH}_2)\text{CO}_2\text{Et}$ , by shaking the acid with concd.  $\text{NH}_4\text{OH}$  at room temp. for 6-8 hrs., leaflets, m.  $125^\circ$ . A 72% yield of  $(\text{CH}_3)_2\text{C}(\text{CONH}_2)_2$  was obtained when the acid and concd.  $\text{NH}_4\text{OH}$  were shaken occasionally for 3 days, or a 55% yield by heating at  $50^\circ$  for 4 hrs. The bromo derivative,  $\text{C}_6\text{H}_5\text{O}_2\text{N}_2\text{Br}$ , obtained by the action of Br on a KOH soln., pale yellow, decomp.  $163^\circ$ . With MeONa this gives 5-cyclopropanespirohydantoin, microneedles, m.  $214^\circ$ . It yields a Ag and a Na salt. Dibromo derivative, needles, decomp.  $224-5^\circ$ . Cyclobutane-1,1-dicarboxamide, microneedles, m.  $275-7^\circ$ . Bromoamide, small, pale yellow needles, decomp.  $160^\circ$ . 5-Cyclobutanespirohydantoin, needles, m.  $225^\circ$ . Dimethylmalonbromoamide, small, pale yellow needles, decomp.  $157^\circ$ . Diethylmalonbromoamide, decomp.  $160^\circ$ . 1-Carbamidocyclopropane-1-carboxylic acid, by heating the hydantoin with NaOH for 1 hr., then acidifying with concd. HCl and concg. at room temp., prisms, m.  $200^\circ$  (decompn.).  $\text{HNO}_3$  gives the 1-nitroso derivative, small yellow granules, decomp. explosively  $160^\circ$ . The filtrate from this deriv. contains 1-aminocyclopropane-1-carboxylic acid, isolated as the hydrochloride, prisms, m.  $222^\circ$  (decompn.). In EtOH-HCl this gives ethyl 1-aminocyclopropane-1-carboxylate, analyzed as the hydrochloride, m.  $107^\circ$ . 1-Aminocyclopropane-1-carboxamide, transparent needles or plates, m.  $122-3^\circ$ . Hydrochloride, small prisms, m.  $218^\circ$  (decompn.). The action of alkali on the NO deriv. or of  $\text{HNO}_3$  on the  $\text{NH}_2$  deriv. gives 1-hydroxycyclopropanecarboxylic acid, transparent plates or needles, m.  $109-10^\circ$ . With concd.  $\text{H}_2\text{SO}_4$  this yields cyclopropanone and  $\text{EtCO}_2\text{H}$ .

C. J. Wessr

**Influence of temperature and constitution upon the rate of decomposition of substituted malonic acids.** H. JAKUBOWICZ. *Z. anorg. allgem. Chem.* 121, 113-27(1922).—J., following the method of Bernoulli and Wege (*C. A.* 14, 1665) detd. the rate of splitting, to give  $\text{CO}_2$ , of various substituted malonic acids in 0.2 N aq. solns. at elevated temps. Plotting temps. against the velocity const.  $k \times 10^4$ , the curves are parallel between about  $90^\circ$  and  $110^\circ$  for diethyl-, diallyl-, dichloro-, and dibromo malonic acids. J. concludes that the temp. curves of all disubstituted malonic acids in which the 2

substituents are alike will be parallel at the above temps.  $K$  for  $\text{Et}_3\text{C}(\text{CO}_2\text{H})_2$  is below that of the mono-Et acid at  $105^\circ$ , but above it at  $110^\circ$ . The temp. of  $86^\circ$  detd. by B. and W. by graphic extrapolation as the lowest temp. at which sapon. of malonic acids will occur, has been exptly. verified by J. However,  $\text{PhCH}(\text{CO}_2\text{H})_2$  begins to decomp. at  $40^\circ$ . The substitution of an OH group in malonic acid, to give tartronic acid, or of a Cl atom to give  $\text{ClCH}(\text{CO}_2\text{H})_2$ , markedly raises the reaction velocity.  $K$  of the latter lies between the values for allyl- and benzylmalonic acids. In  $\text{Cl}_2\text{C}(\text{CO}_2\text{H})_2$ , the 2 like substituents tend to cause  $k$  to have a smaller value, but this is partly counterbalanced by the negative Cl. The second Cl decreases  $k$  by  $1/3$ . Dichloro- decomp. more rapidly than dibromomalonic acid.  $\text{BrCH}(\text{CO}_2\text{H})_2$  splits off HBr on heating in  $0.2\text{ N}$  aq. soln. In general, a rise of  $10^\circ$  increases the rate of sapon. 2-3 times.

E. H. VOLWILER

Action of 2-methyl-2-bromopropanal upon sodium malonic ester. ADOLF FRANKF. AND GERALD GROEGER. *Monatsh.* 43, 55-60(1922).— $\text{Me}_2\text{CHCHO}$  is conveniently and quickly prepd. by passing the vapors of the alc. over brass shavings in a glass tube heated to dark redness. The reaction of  $\text{Me}_2\text{CBrCHO}$  and  $\text{CHNa}(\text{CO}_2\text{Et})_2$  gave *ethyl 2-pentene-1,4-olide-4-methyl-2-carboxylate*,  $\text{Me}_2\text{C}.\text{CH}:\text{C}(\text{CO}_2\text{Et}).\text{CO}_2\text{O}$ ,  $b_m$   $177-8^\circ$ ,

transparent crystals, m.  $68^\circ$ . Sapon. gave the *lactone acid*,  $\text{C}_7\text{H}_{10}\text{O}_4$ , m.  $127^\circ$ , decomp.  $180^\circ$ . Oxidation with neutral  $\text{KMnO}_4$  gave the compound  $\text{Me}_2\text{C}.\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CO}_2\text{O}$ ,

m.  $97^\circ$ . The condensation product with  $\text{AcCHNaCO}_2\text{Et}$  has the formula  $\text{C}_{10}\text{H}_{16}\text{O}_4$ , and is being investigated.

C. J. WEST

Ring-chain tautomerism. II. The effect of the *gem*-diethyl group on the carbon tetrahedral angle. S. S. DESHAPANDE AND J. F. THORPE. *J. Chem. Soc.* 121, 1430-42 (1922); cf. C. A. 16, 2141.—The Et group deflects the tetrahedral angle to a greater extent than the Me group but the effect of 2 of them is not so great as that which is due to the  $(\text{CH}_3)_4$  ring. Both C atoms of the Et group exert an influence on a C atom linked to 1 of them and the effect is not that of a single C atom as might be supposed. *Ethyl  $\alpha,\alpha'$ -dibromo- $\beta,\beta$ -diethylglutarate* (A), by the action of Br upon the acid chloride at  $70^\circ$  and pouring into abs. EtOH,  $b_p$   $190^\circ$ . If the bromination product is poured into  $\text{HCO}_2\text{H}$ , the *dibromo acid* is obtained as thick prisms, m.  $153^\circ$  (decompn.). The action of concd. KOH (60 g. in 50 cc.  $\text{H}_2\text{O}$ ) upon the mono-Br acid ester results in the formation of *cis*- and *trans*-3,3-diethylcyclopropane-1,2-dicarboxylic acids, the *trans*-acid being the more insol.; it forms long prisms, m.  $240^\circ$  and sublimes on heating. The *dianilide* forms light needles, m.  $274^\circ$  (decompn.). The *cis*-acid seps. from AcMe-petrol. ether in small prisms, m.  $170^\circ$  with loss of  $\text{H}_2\text{O}$ . The *anhydride* is obtained by heating the acid above its m. p. under reduced pressure; it is an extremely hygroscopic liquid which is readily transformed into the *cis*-acid on exposure to moisture. With  $\text{PhNH}_2$  it yields an *anilic acid*,  $\text{C}_{15}\text{H}_{19}\text{O}_4\text{N}$ , small needles, m.  $192-4^\circ$ . Heated above its m. p., it yields the *anil*, small needles, m.  $120^\circ$ . Hydrolysis of A with dil.  $\text{Na}_2\text{CO}_3$  gave the *hydroxylactonic acid*,  $\text{Et}_2\text{C}.\text{CH}(\text{CO}_2\text{H}).\text{O}.\text{CO}.\text{CHOH}$ , thick prisms, m.  $148-9^\circ$ ,

and the *ethyl ester*, needles, m.  $94-5^\circ$ . The acid is unaltered by strong aq. KOH and thus there is no evidence of tautomerism between the forms: hydroxylactonic acid—hydroxy-ring acid—keto acid. Hydrolysis with concd. KOH gives principally  $\alpha$ -keto- $\beta,\beta$ -diethylglutaric acid, stellate clusters of needles, m.  $127-8^\circ$ ; *semicarbazone*, small prisms, m.  $181^\circ$  (decompn.). *Acid calcium salt*, pptd. from the neutral Ca salt and acid. The other product is 3,3-diethylcyclopropane-1-ol-1,2-dicarboxylic acid, plates, m.  $199-200^\circ$ . It does not react with AcCl or BzCl. *Dianilide*, needles, m.  $182^\circ$ . The *ethyl ester*,  $b_m$   $180-4^\circ$ , is quant. hydrolyzed by concd. HCl in 2 min. Either of the last 2 acids is converted by 64% aq. KOH into an equil. mixt. composed approx. of

38% of the keto acid and 62% of the cyclic HO acid. The equil. is independent of the amt. of alkali used and of the duration of heating but is attained only after a definite time.

C. J. WEST

**Synthesis of the polyacetic acids of methane. VI. Methanetriacetic acid and its unstable esters.** C. K. INGOLD AND E. A. PERREN. *J. Chem. Soc.* 121, 1414-20 (1922); cf. C. A. 16, 410.— $(\text{EtO}_2\text{C})_2\text{C}:\text{C}(\text{CO}_2\text{Et})_2$  and  $\text{NCCH}_2\text{CO}_2\text{Et}$  condense in the presence of  $\text{C}_4\text{H}_{11}\text{N}$  (3 weeks at ordinary temp. and 1 week at  $0^\circ$ ) to form *ethyl*  $\omega$ -cyano- $\omega'$ , $\omega''$ -dicarboxymethanetriacetate,  $b_{17}$   $242^\circ$ . The yield is fairly good. Alc.  $\text{EtONa}$  decomps. it to  $(\text{EtO}_2\text{C})_2\text{C}:\text{CHCH}(\text{CN})\text{CO}_2\text{Et}$  and  $\text{CH}_2(\text{CO}_2\text{Et})_2$ , while mineral acids hydrolyze it to  $\text{HC}(\text{CO}_2\text{H})_2$ . The crude reaction product may be hydrolyzed directly by allowing it to stand with cold concd.  $\text{H}_2\text{SO}_4$  for 15 hrs. If the yield of ester is assumed to be 50%, the yield of acid is 74%. The product is treated with  $\text{KMnO}_4$  in aq.  $\text{Na}_2\text{CO}_3$  at  $60^\circ$  and the acid then crystd. from  $\text{Et}_2\text{O}$ .  $\text{C}_4\text{H}_{11}\text{N}$  should find large application in cases in which the retrograde reaction is pronounced under the usual conditions of the Michael condensation.

C. J. WEST

**The preparation of methylenecitric acid.** C. CASTALDI. *Boll. chim. farm.* 61, 353-7 (1922).—Expts. in sealed tubes, each contg. a mixt. of 40 g. cryst. citric acid and 6 g.  $(\text{CH}_2\text{O})_2$ , showed that with 3 hrs.' heating the max. yield of methylenecitric acid (A) was obtained at  $145^\circ$ . Higher temps. did not increase the yield, while temps. below  $120^\circ$  gave only traces of the product. Under the same conditions tubes of 90 cc. capacity gave almost twice the yield obtained with 150-cc. tubes. Higher pressures would probably improve the yield still further. "Helmitol," the hexamethylenetetramine salt of A, is readily prepd. in cryst. form by mixing hot satd. solns. of the components and cooling.

A. W. DOX

**Aleuritic acid.** C. HARRIES AND W. NAGEL. *Chem. Umschau* 29, 135-7 (1922).—Tschirch considered aleuritic acid to be dihydroxytridecylic acid. H. and N. show, by ultimate analysis, Ac no., and its reduction to palmitic acid, that it is trihydroxypalmitic acid,  $\text{C}_{16}\text{H}_{32}\text{O}_6$ . Me ester m.  $69-70^\circ$ ; free acid m.  $100-1^\circ$  (Tschirch,  $105.5^\circ$ ). There is 30% of this acid present in the ether-insol. portion of sheallac. P. ESCHER

**Constitution and rotatory powers of mannitol and fructose complexes formed in solutions containing boric acid and sodium hydroxide.** GEORGE VAN BARNEVELD GILMOUR. *J. Chem. Soc.* 121, 1333-40 (1922).—Rotation measurements have been made with the view of showing the effects of reagents on manniboric acid (A) and fructoboric acid (B) or their salts rather than on the alc. and sugar. In the case of A the rate of increase in rotation is roughly proportional to the  $\text{NaOH}$  added until about  $1/2$  of the equiv. is present, beyond which the increase is still proportional but greater than the rate during the earlier stage. Addition in excess of the equiv. is practically without effect. The rate of decrease in the case of B is proportional to the  $\text{NaOH}$  added until about  $1/2$  equiv. is present and then it falls off with each addn. This indicates that in solns. of acids like A the mols. are associated in groups of 3, probably having an oxonium structure. The change that takes place after about  $1/2$  equiv. has been added is possibly due to the breaking up of the complex. mols. In the case of solns. containing 2 mols. mannitol to 1 of A, or of fructose and B, the rate of change in rotation in both cases is approx. proportional to the  $\text{NaOH}$  added until 1 equiv. is present. When the equiv. of  $\text{NaOH}$  is present, the complexes trimannitol- $\text{NaBO}_2$  and trifructose- $\text{NaBO}_2$  must be present. From the regularity in the rate of change in rotation, the complexes are probably formed before the addition of the alkali. The addition of  $\text{H}_3\text{BO}_3$  lowers the rotation of Na manniborate (C) and raises that of Na fructoborate (D) while the opposite effect is obtained with  $\text{NaBO}_2$ . The rotation of mannitol in the form of C was found to be  $[\alpha]_D$   $22.1^\circ$ , that of fructose in the form of D  $[\alpha]_D$   $-35.2^\circ$ . Conc'n. seems to affect the rotation of C and D very little.

C. J. WEST

**2,3,6-Trimethylglucose.** J. C. IRVING AND E. L. HIRST. *J. Chem. Soc.* **121**, 1213–23 (1922).—2,3,6-Trimethylglucose does not form cryst. derivs. and, so far, the identification of the sugar depends primarily on the isolation of the compd. in a pure cryst. condition. The following yields have been obtained from various sugar derivs.: trimethylmethylglucoside, by direct crystn., 50%; heptamethylmethylcellobioside, by fractional extn. with light petroleum, 50%; heptamethylmethylactoside, by removal of tetramethylgalactose as the anilide, followed by isolation of trimethylmethylglucoside and hydrolysis, 50–60%; the same, after glucoside formation without sepn. of the anilides, 30%; the same, by fractional pptn. of Et<sub>2</sub>O solns. with light petroleum, 17%; the same, by conversion into the anilides and direct isolation of trimethylglucose, variable, often very low. The cor. consts. are: fine needles or short prisms, m. 122–3° or 92–3°;  $n_D$  of sirup, 1.4743;  $[\alpha]_D$  in MeOH 117.7  $\rightarrow$  88.6° (no catalyst); in H<sub>2</sub>O 90.2  $\rightarrow$  70.5° (no catalyst). The optical values are an additional method of discriminating between this and the 2,3,5-deriv. In MeOH a trace of HCl gives a final value of  $[\alpha]_D$  as 70.0°. The oxime is a sirup sol. in Et<sub>2</sub>O with  $[\alpha]_D$  in EtOH of 42°; the anilide is a yellow sirup. 2,3,6-Trimethylmethylglucoside is a comparatively mobile sirup,  $b_{20}^{20}$  150°,  $n_D$  1.4583, and shows the following values for  $[\alpha]_D^{20}$ : H<sub>2</sub>O (c 1.10) 63.0°; EtOH (c 1.221) 66.5°; CHCl<sub>3</sub> (c 1.266) 62.0°; AcMe (c 1.519) 70.4°. This is a mixt. of the  $\alpha$ - and  $\beta$ -forms, the optical consts. of which also serve to distinguish the 2 isomers. The oxidation of 2,3,6-trimethylglucose followed by esterification gave diethyl dimethylsaccharate, yellow viscous sirup,  $b_{20}^{20}$  55°,  $n_D$  1.4610,  $[\alpha]_D$  61.7° in EtOH. Lead salt, white powder. Analysis confirms the loss of a MeO group during oxidation and excludes the possibility of confusion with an Et trimethylsaccharate. C. J. WEST

**Synthesis of 2-hexosaminic acids and of 2-hexosamines.** P. A. LEVENE. *Biochem. Z.* **124**, 37–83 (1921).—This is an attempt to settle the configurations of 2-hexosamines, particularly with regard to the 2-C atom, for which the Walden inversion had made former data useless. Much evidence is presented, indirect, but cumulative and convincing, that in these cases the 2-C atom rotates to the right when the remainder of the configuration corresponds to gluconic acid; and to the left when it resembles mannonic acid. Configurations for *d*-aminopentosides, 2,5-tetrahydroxyadipic acids, chitose, and epichitose, are given. Optimum conditions, varying from case to case, are given in detail for the following reactions, but cannot be abstracted. Chitosaminic acid (A) heated with C<sub>6</sub>H<sub>5</sub>N (10% in H<sub>2</sub>O) gave much unaltered A and epichitosaminic acid (B) as the more sol. fraction. 3 g. crude B with 1 g. BzH in 2 cc. abs. EtOH, satd. with HCl gas and let stand 24 hrs., then treated with dry ether, gave the lactone hydrochloride (C) of B, white prismatic needles from MeOH, m. 203° (decompn.),  $[\alpha]_D^{20}$  45°. C, hydrolyzed with Ba(OH)<sub>2</sub>, gave pure B, prismatic needles, m. 198° (decompn.),  $[\alpha]_D^{20}$  10° (at equil. 39°). For the prepn. of hexosaminic acids from 1-aminopentosides, 30 g. of the latter in 50 cc. H<sub>2</sub>O was heated with 40 cc. of 80% HCN and 5 cc. NH<sub>4</sub>OH till the solu. became dark and viscous (in one case, 8–15 mins. at 30–35°). The crude mixt. of chondrosaminic acid (D) and epichondrosaminic acid (E) yielded D, m. 206° (decompn.),  $[\alpha]_D^{20}$  8° (identical with the oxidation product, of natural chondrosamine (K)), and E,  $[\alpha]_D^{20}$  –17.5°. Similarly, xylohexosaminic acid (F), m. 200° (decompn.),  $[\alpha]_D^{20}$  –11° (at equil., –30°). The isomeric acid (G) showed  $[\alpha]_D^{20}$  14°. *d*-Dextroxylohexosaminic actone hydrochloride, from G in abs. EtOH with HCl, m. 205° (decompn.); by the method for B above, it gave G, m. 224° (decompn.). Monobenzal-*d*-levohexosaminic lactone hydrochloride (H) from the acid and BzH in abs. EtOH with HCl, m. 206° (decompn.); hydrolyzed with Ba(OH)<sub>2</sub>, it gave F. Levo-*d*-ribohexosaminic acid, less sol. in H<sub>2</sub>O than J, insol. in org. solvents, m. 212° (decompn.),  $[\alpha]_D^{20}$  –11°. Dextro-*d*-ribohexosaminic acid (J), from the mother liquors of H, m. 186°,  $[\alpha]_D^{20}$  12.5°; lactone hydrochloride m. 150°,  $[\alpha]_D^{20}$  21.5°; dibenzal derivative m. 221°,  $[\alpha]_D^{20}$  –26°. The re-



duction of the above hexosaminic acids to the corresponding hexosamines requires pure materials, but the isolation of the lactone-HCl is not necessary. Reduction was effected by 2% Na-Hg in a freezing mixt., and the reaction controlled by titration with Fehling soln. *Pentabenzoylchitosamine* m. 216°,  $[\alpha]_D^{20}$  44.4 (in  $C_6H_5N$ ). *Chondrosamine* (K) from xylohexosaminic acid, m. 185°,  $[\alpha]_D^{20}$  59.30° (at equil., 98.80°). The hydrochloride was obtained in two forms,  $\alpha$ ,  $[\alpha]_D^{20}$  53.14° (at equil. 90.42°); and  $\beta$ ,  $[\alpha]_D^{20}$  125° (at equil., 95°). The penta-Ac derivs. showed  $\alpha$ , m. 237° (decompn.),  $[\alpha]_D^{20}$  8.75° in  $CHCl_3$ ;  $\beta$ , (not quite pure) m. 197°,  $[\alpha]_D^{20}$  90°. Epichitosamine showed (in 5% HCl)  $[\alpha]_D^{20}$  -4.7°, and gave an osazone m. 205°. Dextroxylohexosamine (L) could not be isolated; *pentabenzoyl derivative*, m. 162°,  $[\alpha]_D^{20}$  77.6°; osazone from m. L, 173° (decomp. 185°). B, deaminated and reduced with Al-Hg (to destroy  $HNO_3$ ) gave 2,5-anhydromannonic acid,  $[\alpha]_D^{20}$  35.5°. The lactone of B gave similar results. By deamination and oxidation with  $Br_2$ , K and E were converted to 2,5-anhydrotalonic acid; *brucine salt* ( $H_2O$ ), large prisms from MeOH, m. 218°;  $[\alpha]_D^{20}$  -12.4. L gave the same product, whose identity was confirmed by oxidation with  $HNO_3$  to 2,5-anhydrotalomucic acid; *calcium salt* ( $3H_2O$ ),  $[\alpha]_D^{20}$  -7.5 (in 10% HCl). D gave similarly a *brucine salt*, m. 244°,  $[\alpha]_D^{20}$  -9.37°; the corresponding mucic acid m. 205° and is inactive. A, by similar treatment, gave *monopotassium anhydrosaccharate*, ( $0.5 H_2O$ ); *lead salt* ( $2H_2O$ ); *free acid* ( $1H_2O$ ), m. 160°. Epichitosamine, under the same conditions, gave saccharic acid. Both B and its lactone gave the same anhydro acid; Walden inversion may have occurred in both cases. Dextro-*d*-xylohexosaminic lactone and levo-*d*-xylohexosaminic acid both gave 2,5-anhydro-*l*-saccharic acid, m. 163°,  $[\alpha]_D^{20}$  -38.79°; *potassium salt*. Walden inversion occurred in one case, probably that of the free acid. *d*-Levoxylohexosaminic acid gives an acid (*potassium salt* ( $1H_2O$ )),  $[\alpha]_D^{20}$  -37.5°, identical in configuration with anhydrogluconic or anhydrogulonic acid. Dextro-*d*-xylohexosaminic acid gave 2,5-anhydro-*l*-saccharic acid ( $2H_2O$ ),  $[\alpha]_D^{20}$  -78° (hydrate). Lyxohexosaminic acid yielded 2,5-anhydromucic acid, long prisms, m. 208-4° (cor.). K. HCl and dextro-*d*-xylohexosaminic acid both gave, by appropriate treatment, 2,5-anhydro-*d*-talomucic acid (M),  $[\alpha]_D^{20}$  -9° (Ca salt in 10% HCl); D, under the same conditions, gave inactive anhydromucic acid. M was also obtained from J; the free acid, sol. 1:40 in AcMe, m. 179-81°,  $[\alpha]_D^{20}$  -16.55°. Levo-*d*-ribohexosaminic acid gave 2,5-anhydroallomucic acid, inactive; *calcium salt* ( $3H_2O$ ), loses  $3H_2O$  in *vacuo* in xylene vapor. Epichitosamine-HCl gave, when warmed with  $HgO$ , epichitose, m. 240° (cor.) (decompn.),  $[\alpha]_D^{25}$  -96° (no change at equil.). 3-Aminoheptonic acids have never yet been obtained altogether pure. Chitosamine-HCl, through the cyanohydrin synthesis, gave *dextro-d*-chitosaminoheptonic acid,  $[\alpha]_D^{20}$  6.5°, in yields of 15-30%. *Levo-d*-chitosaminoheptonic acid,  $[\alpha]_D^{20}$  -7.5° (after 24 hrs., -12°), prismatic needles, m. 139° (decompn.). Similarly, K. HCl gave a mixt. from which were sepd. *levo-d*-chondrosaminoheptonic acid, prisms, m. 139° (cor.),  $[\alpha]_D^{25}$  -8.25° (after 24 hrs., -13°), and *dextro-d*-chondrosaminoheptonic acid,  $[\alpha]_D^{25}$  varies from 16° to 42.5°.

BEN H. NICOLET

The action of ozone on solutions of pure lactose. C. W. SCHONEBAUM. *Rec. trav. chim.* 41, 422-4(1922).—Aside from the statement of Gorup-Besanez (*Ann.* 110, 86(1859)) that lactose is not decompd. in the ozonization of milk there are no data in the literature on the subject. S. used air contg. 3 g.  $O_3$  per m.<sup>3</sup> and passed 200 l. per hr. through a 100-cc. soln. contg. 5 g. lactose, using  $H_2O$ , 0.1 N  $H_2SO_4$  and 0.1 N NaOH as solvents, for 3 hrs. at 70°. In alk. soln. lactose is decompd. by  $O_3$ , the alkalinity falls and acids (including  $HCO_2H$ ) are formed. With 4 N alkali  $CO_2$  is formed in an hr.; with 0.1 N NaOH no  $CO_2$  is formed in 3 hrs. In neutral soln. lactose is not decompd. by  $O_3$  of this low concn. at 70° and the acid soln. does not invert it in the presence or absence of  $O_3$ . Since the intermediate products in the manuf. of lactose are considerably improved as to color and odor this treatment with  $O_3$  will be of consider-

able importance. The facts here stated were also confirmed in the process of manuf. of lactose.

E. J. WITZMANN

**Toad venom.** HEINRICH WIELAND. *Sitzb. bayer. Akad. Wiss.* 1920, 329-43.—The formulas given to bufotalin and some of its derivs. by W. and Weil (*C. A.* 8, 347) must be changed, since it is found that bufotalin retains org. solvents of crystn. most energetically. Bufotalin crystd. from alc. is not  $C_{48}H_{84}O_4$ , but  $C_{48}H_{80}O_4 \cdot C_2H_4O$  (which has the same % compn.). Crystals from EtOAc m.  $154^\circ$  and have the compn.  $2C_{48}H_{80}O_4 \cdot C_2H_4O$ . The solvent is given off slowly in a high vacuum at  $150^\circ$ , and on careful heating in a high vacuum at  $225-30^\circ$  bufotalin sublimes. Of the 6 O atoms, 2 are present as a lactone group, 2 as an Ac group, and 2 are HO. Of the latter groups, one is capable of acetylation, which yields *acetylbufotalin*,  $C_{48}H_{80}O_7$ , m.  $254^\circ$ , and the other can be oxidized to a C:O group, present in *bufotalone*,  $C_{48}H_{78}O_6$ , m.  $261^\circ$ . Bufotalin is reduced by Pd black and H to *tetrahydrobufotalin*,  $C_{48}H_{86}O_4$ , m.  $204-5^\circ$ . Bufotalien, formed by the action of concd. HCl on bufotalin, is  $C_{48}H_{80}O_3$  (not  $C_{48}H_{78}O_3$ , as previously supposed). In its formation 1 mol. of AcOH and 1 of water are removed from bufotalin. Bufotalien m.  $222-3^\circ$  and is yellow. It is reduced catalytically by Pd to colorless *bufotalan*,  $C_{48}H_{80}O_3$ , m.  $198-9^\circ$ , and hence contains 4 double bonds. Unlike its precursors, bufotalan does not give Liebermann's cholesterol reaction with  $Ac_2O$  and  $H_2SO_4$ . The C skeleton of bufotalin (apart from the Ac group) is derived from a satd. hydrocarbon,  $C_{48}H_{94}$ , with 8 H atoms less than the corresponding aliphatic one. Hence bufotalin contains 4 C rings. Now the bile acids are also derived from a complex,  $C_{26}$ , with 4 rings, and, as was shown by Windaus and Neukirchen (*C. A.* 14, 1983), cholesterol differs from the bile acids by an additional iso-Pr group at the end of a side-chain,  $CHMe_2CH_2CH_2CH_2CHMe-$ , which in cholic acid is represented by  $CHO_2CH_2CH_2CHMe-$ . W. considers it very probable that in bufotalin this side-chain is further

oxidized to a  $\gamma$ -lactone,  $\begin{array}{c} CH_2 \cdot CMe \\ | \\ CH_2-CO \end{array} O$ , and the chief problem at present is to convert

bufotalan,  $C_{48}H_{80}O_3$ , into cholanolic acid,  $C_{26}H_{46}O_2$ , the parent substance of the bile acids. A second cryst. toxic substance from the skin of the toad, previously called bufotalein by W. and Weil, is now named *bufotalidin*,  $C_{48}H_{80}O_7$ , probably hydroxybufotalin. With alc. of crystn., it melts at  $175^\circ$  and, after heating in a high vacuum, at  $228-30^\circ$ . Bufagin, the venom of the tropical toad *Bufo agui*, isolated by Abel and Macht (*C. A.* 6, 777), is certainly not identical with bufotalin, and according to Faust, has only  $1/10$  of the physiol. action of the latter. W. is not convinced that the mol. wt. of bufagin has been correctly detd., and considers that Abel and Macht's formula,  $C_{48}H_{82}O_4$ , may require alteration to  $C_{47}H_{80}O_4$ , which is that of a Me ether of bufotalin. [The above toad venoms are heart poisons and pharmacologically similar to digitalis and strophanthus. Digitoxigenin is, according to Cloetta (*C. A.* 15, 707),  $C_{44}H_{78}O_6$ , and strophanthidin (cymarigenin, *C. A.* 9, 2378) has 23 or possibly also 24 C atoms. All these heart poisons from various animal and vegetable sources seem to be related to cholesterol and the bile acids.] J. C. S.

**Kinetics of open saturated chains of carbon atoms in relationship to the Baeyer strain theory.** Z. WOJNICZ-SIANOZENCKI. *Roczniki Chemji* 1, 244-75 (1921).—It is shown that the kinetics of an open satd. chain of C atoms may be treated by the theory of probabilities. If it be admitted that the limiting distance over which the C atom can exert a chem. force is not more than 2101 times that which is normal for the two atoms connected by a single linking, then it is shown that the probability of the formation of polymethylene rings contg. various nos. of C atoms follows the order  $f_2 > f_3 > f_4 > f_5 > f_6 > f_7 > f_8 > f_9 > f_{10}$ , where  $f_n$  is the probability of formation of an  $n$ -membered C ring. This indicates that the double linking is more easily formed than the 5-membered ring,

and this more easily than the 6-membered ring, and so on. This appears to be in keeping with exptl. work, which is often contradictory to the usually adopted hypothesis.

J. C. S.

**Wurtz-Fittig synthesis.** WALTER FUCHS AND HEINRICH METZL. *Ber.* **55B**, 738-47 (1922).—The observation of Goldschmidt (*Monatsh.* **7**, 40 (1886)) that 1,3,5- $C_6H_3Br_3$  (A) can be refluxed for hrs. with Na in  $Et_2O$  without change has been confirmed but it was found that with K or better with a K-Na alloy it can be made to react, at least in part, yielding substances forming  $H_2O$ -sol. salts with alkalies and an amorphous  $H_2O$ - and  $Et_2O$ -insol. substance (B) contg. C, H, Br and O (one sample analyzed for  $C_{30}H_{16}O_{14}Br_2$ ) and yielding  $m$ - $C_6H_4(OH)_2$  on cleavage with HI, so that it must be a phenol ether of high mol. wt. The alkali-sol. substances give with acids amorphous ppts. sol. in  $Et_2O$  and sepd. into 2 fractions by means of  $NaHCO_3$ ; they thus consist of a mixt. of phenols and  $CO_2H$  acids. 1,2,4- $C_6H_3Br_3$  (C) behaves in the same way, while 3,5- $Br_2C_6H_3Me$  (D), which reacts quant. with Na, yields only O-free compds., ( $m$ - $MeC_6H_4$ )<sub>2</sub> (E) and, chiefly, yellow amorphous substances of the compn.  $C_{30}H_{16}Br_3$ ,  $C_{38}H_{32}Br_2$ ,  $C_{42}H_{32}Br_2$ ,  $C_{46}H_{32}Br_2$ , apparently of the general type  $BrC_6H_2Me(C_6H_2Me)_x$ - $C_6H_2MeBr$ ; the latter are probably mixts. and it is believed that the same is true of the supposed homogeneous compds. obtained by G. from  $Br_2C_6H_3Me$  and the three  $C_6H_2Br_2$ . Probably 2 mols. of the original Br compd. react to form a  $Ph_2$  deriv., this reacts further with the original compd. or with itself, the product of this reaction reacts still further, etc. Although all the materials were carefully dried and protected from moisture during the reaction, 8% E was obtained from D and its yield can be materially increased by greatly shortening the length of boiling (20% after 20 hrs.). This can be explained only on the assumption that the Wurtz-Fittig synthesis does not take place through free radicals but through very reactive metal compds. contg. alkali in the place of the Br, which may either react normally or with the O of the air, forming alkali phenolates, or, as in the case of D, they may undergo the intermediate decompn. only in part and on treatment with  $H_2O$  yield the corresponding H compd. (E). In the case of A and B, the resulting ONa groups may remain as such or react with the halides according to the Williamson reaction, giving compds. of the type  $BrC_6H_2(OH)OC_6H_2(OH)OC_6H_2(OH)Br$ . The ratio of  $CO_2H$  acids to phenols formed remains unchanged when atm.  $CO_2$  is excluded during the reaction, and as the Schotten-Baumann method showed that these acids are phenolcarboxylic acids and as the methods of working up the products involved tedious filtrations of alk. solns., they are possibly formed only as the result of secondary processes. That metal substitution products play a role in the process is also indicated by the appearance of deep dark or gray-blue to blue-black flocculent or powdery masses during the reaction. From 65 g. A refluxed 120 hrs. with 20 g. Na-K alloy in  $Et_2O$  and then allowed to stand 140 hrs. were obtained 40 g. unchanged A, 3.5 g. B, m. above  $365^\circ$ , and about 4 g. of the mixt. of phenols and  $CO_2H$  acids, about  $\frac{2}{3}$  of which was sol. in  $NaHCO_3$ ; the phenol portion hardly gave any color with  $FeCl_3$  and no ppt. with Br water, gave positive Baeyer and Beilstein tests and by the Schotten-Baumann method yielded a benzoate m. about  $66^\circ$ ; the  $NaHCO_3$  ext. on acidification yielded yellowish flocks, m. about  $150^\circ$  and giving a ppt. with  $FeCl_3$ . From 23 g. C and 5 g. Na-K boiled 170 hrs. were obtained about 7 g. unchanged C, 1 g. of a substance  $C_{30}H_{20}Br_3$ , m. about  $130^\circ$ , sol. in  $C_6H_6$  with green-blue fluorescence, 0.8 g. of a dark-brown insol. powder  $C_{30}H_{16}O_{13}Br_2$ , does not m.  $360^\circ$ , 1 g. of phenols,  $C_{30}H_{16}O_4Br_2$ , red-yellow mass giving a faint dirty green color with  $FeCl_3$  and a benzoate m. about  $123^\circ$ , and 1.2 g. acids,  $C_{30}H_{16}O_4Br_3$ , giving a yellowish ppt. with  $FeCl_3$ ; both the phenol and acid portions gave positive Baeyer and Beilstein tests. D (30 g.) boiled 73 hrs. with 5 g. Na yielded 0.9 g. E, b.  $280-1^\circ$ , 8 g. of  $Et_2O$ -sol. substance  $C_{46}H_{32}Br_2$ , m. about  $66^\circ$ , 2 g.  $Et_2O$ -sol. substance  $C_{46}H_{32}Br_2$ , and 2.5 g.  $Et_2O$ -insol.

substance  $C_{10}H_{13}Br$ , m. about  $180-2^{\circ}$ ; after 20 hrs. boiling the yields were 2.4 g. E, 15.5 g.  $Et_2O$ -sol. and 0.75 g.  $Et_2O$ -insol. substances and 1 g. unchanged D. C. A. R.

**Action of sodium bisulfite on nitro compounds of the benzene series.** HUGO WEIL AND E. MOSER. *Ber.* 55B, 732-7 (1922); cf. Ger. pat. 151,134.—Sulfaminic acids,  $RNHSO_3H$ , are in a great no. of cases, perhaps always, the primary products of the reduction of  $NO_2$  compds. of the  $C_6H_5$  series with bisulfites. At the same time there are obtained smaller amts. of sulfonic acids which, however, are not present as such in the reduction soln. for they cannot be pptd. by cold dil. acids or (as their salts) by alkali and  $NaCl$  until the soln. has been boiled with mineral acids; this is not due to a migration of a  $SO_3H$  from the  $NH_2$  group of the sulfaminic acids to the nucleus, for the sulfaminic acids, after isolation, cannot be converted in this way into sulfonic acids; it is much more probable that the sulfonic acids result from a very sol. sulfo-sulfaminic acid,  $HO_2SC_6H_4NHSO_3H$ , by hydrolysis of the  $N-SO_3H$  group. The ratio of sulfonic to sulfaminic acid is always the same (about 25:75 in the case of  $p-O_2NC_6H_4Me$ , 40:60 in that of the  $o$ -deriv. and 55:45 with  $PhNO_2$ ); the sulfonic acid in the last case is  $p-H_2NC_6H_4SO_3H$ . The reduction of the  $NO_2$  group to  $NHSO_3Na$  can be effected completely with 3 mols.  $NaHSO_3$  but under these conditions there are always formed  $NaHSO_4$  or  $Na_2SO_4 + H_2SO_4$  and the free acid hydrolyzes the sulfaminic acids to the sulfates of the corresponding bases, this action must be prevented by the addition of 2 more mols.  $NaHSO_3$  or 1 mol.  $Na_2SO_3$ . Towards alkalies, on the other hand, the sulfaminic acids are remarkably stable; refluxing for hrs. with 50%  $KOH$  in a Cu vessel does not change them. The imide H in these acids can easily be replaced by Me but only with great difficulty by Et and it cannot be replaced by acid residues.  $PhNO_2$  (25 g.) treated with 150 cc. of 40%  $NaHSO_3$ , then with another 50 cc. previously neutralized with  $NaOH$ , dild. to 2 l., refluxed until the  $PhNO_2$  disappears (about 3 hrs.), concd. to about 0.5 its original vol., cooled, filtered from the  $Na_2SO_3$  and further concd., gives sodium phenylsulfaminat,  $PhNHSO_3Na \cdot 2H_2O$ ; solns. treated cold with dil.  $HCl$  and  $BaCl_2$  remain clear but on heating quickly decomp. into  $PhNH_2$  and  $H_2SO_4$ . In the mother liquors from the salt, after boiling with mineral acids,  $p-H_2NC_6H_4SO_3H$  can be identified by diazotizing and converting into  $p-ClC_6H_4SO_3H$  and then into the amide, m.  $143-4^{\circ}$ . Sodium *p*-tolylsulfaminat, anhydrous; *o*-isomer. Sodium *o*-chlorobenzenesulfaminat, needles with  $1H_2O$  from alc.; *p*-isomer, anhydrous. Sodium *p*-phenolesulfaminat, slender prisms from alc. Sodium *o*-anisolesulfaminat, seps. with 1.5  $H_2O$ . Sodium *p*-carboxybenzenesulfaminat, needles. Shaken 1 hr. with  $NaOH$  and  $Me_2SO$ , in  $H_2O$ ,  $p-MeC_6H_4NHSO_3Na$  gives the *N*-methyl derivative, prisms with 1.5  $H_2O$ , stable in the air but decomp. on moderate heating and at  $60^{\circ}$  evolves a strong odor of  $p-MeC_6H_4NHMe$ , which can be identified as its Ac deriv., m.  $83^{\circ}$ . *N*-Ethyl derivative, obtained together with unchanged  $MeC_6H_4NHSO_3Na$ , after 3 days' shaking with a large excess of  $Et_2SO_4$ , seps. with  $3H_2O$ . C. A. R.

**Syntheses with cyanamide.** EMIL FROMM. Preparation of thiocarbamine cyanides, carbamine cyanides and biurets. With HERMANN WENZL. *Ber.* 55B, 804-13 (1922).—Contrary to the belief of Wunderlich (*Ber.* 19, 448 (1886)) and of Hecht (*Ber.* 23, 1658 (1890)), when mustard oils react with  $NaNHCN$ , the Na in the products (and the alkyl groups in the compds. obtained from them with alkyl halides) is attached not to the N but to the S of the mustard oil:  $RNCS + NaNHCN \rightarrow RN:C(SNa)NHCN$ .  $RN:C(SR')NHCN$ , for from  $PhNCS$ ,  $NaNHCN$  and  $PhCH_2Cl$  is obtained Fromm's  $PhN:C(SCH_2Ph)NHCN$  (A) (*Ber.* 28, 1302 (1895)) which he prepd. according to the equation  $PhNHCSNHCSNH_2 + 3NaOH + 3PhCH_2Cl \rightarrow 3NaCl + 3H_2O + (PhCH_2)_3S + A$ . In this reaction the  $PhCH_2Cl$  acts partly as an alkylating agent (on the S) and as a desulfurizing agent.  $ClCH_2CH_2OH$  was found to be an even more powerful desulfurizing agent and to give with either dithiobiurets,  $RNHCSNH$ .

CSNH<sub>2</sub>, or with the thiocarbamine cyanides, RNHCSNHCN (resulting from the action of NaNHCN on mustard oils, as shown above), thiodiglycols and three S-free products, viz., PhNHCONHCN, CO(NHPh)<sub>2</sub> and (PhNHCN)<sub>2</sub>. The mechanism of these reactions can be represented as follows: PhNHCSNHCN + 2NaOH = PhNHCSNHCN + Na<sub>2</sub>S + 2H<sub>2</sub>O; 2HOCH<sub>2</sub>CH<sub>2</sub>Cl + Na<sub>2</sub>S = (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>S + 2NaCl; PhNHCSNHCN + H<sub>2</sub>O = PhNHCONHCN + H<sub>2</sub>S; PhNHCONHCN + 2H<sub>2</sub>O = PhNHCONH<sub>2</sub> + CO<sub>2</sub> + NH<sub>3</sub>; 2PhNHCONH<sub>2</sub> + H<sub>2</sub>O = CO(NHPh)<sub>2</sub> + 2NH<sub>3</sub> + CO<sub>2</sub>; PhNHCSNHCN + 2H<sub>2</sub>O = PhNHCSNH<sub>2</sub> + CO<sub>2</sub> + NH<sub>3</sub>; PhNHCSNH<sub>2</sub> + 2NaOH = PhN:C:NH + Na<sub>2</sub>S + 2H<sub>2</sub>O; 3PhN:C:NH = (PhNHCN)<sub>3</sub>. By a sparing use of alkali it is possible to suppress the side reactions almost completely and obtain PhNHCONHCN almost exclusively. As the dithiobiurets are easily prepd. from perthiocyanic acid with primary or secondary amines, the arylcarbamine cyanides thus become easily available. Sodium phenyl-*p*-thiocarbamine cyanide, C<sub>6</sub>H<sub>5</sub>N<sub>2</sub>SN<sub>2</sub>, from 20 g. NaNHCN in 25 cc. cold H<sub>2</sub>O and 25 g. PhNCS slowly treated with 20 cc. alc. and heated 0.5 hr. on the H<sub>2</sub>O bath after the mixt. has solidified to a cryst. magma, crystals in leaflets and on cautious acidification with AcOH yields the free phenylthiocarbamine cyanide, voluminous ppt. which cannot be recrystd. from the higher boiling org. solvents or alc., decomps. 90°, m. around 105°, forms white or greenish compds. with Ag, Cu and Hg salts. Phenylcarbamine cyanide, from 10 g. of the above Na salt in 20 cc. of 10% NaOH and 8 g. HOCH<sub>2</sub>CH<sub>2</sub>Cl heated under a reflux to start the reaction, which then generally continues vigorously without further heating, m. 123-4°; from 10 g. of the Na salt in 50 cc. of 10% NaOH with 10 g. HOCH<sub>2</sub>CH<sub>2</sub>Cl is obtained CO(NHPh)<sub>2</sub>; 10 g. of the Na salt in an excess of 20% NaOH with 15 g. HOCH<sub>2</sub>CH<sub>2</sub>Cl gives (PhNHCN)<sub>2</sub>. The same compds. can be obtained from PhNHCSNHCN. The PhNHCONHCN in H<sub>2</sub>O contg. a few drops H<sub>2</sub>SO<sub>4</sub> heated with steam gives PhNHCONHCNH<sub>2</sub>, m. 167°. *p*-Tolylcarbamine cyanide, from MeC<sub>6</sub>H<sub>4</sub>NHCSNHCN, and HOCH<sub>2</sub>CH<sub>2</sub>Cl in boiling alc. treated with aq. NaOH, m. 142°, hydrolyzed by dil. H<sub>2</sub>SO<sub>4</sub> at 100° to *p*-tolylbiuret, m. 199-200° (decompn.), which does not give the biuret reaction. *p*-Phenetylcarbamine cyanide, m. 131°. *o*-Anisylcarbamine cyanide, decomps. 115°. Ethylphenylcarbamine cyanide, leaflets, m. 142°. C. A. R.

Chlorination of *p*-iododimethylaniline. GEORG SACHS AND LUDWIG LEOPOLD. *Monatsh.* 43, 49-53 (1922).—*o*-Chloro-*p*-iododimethylaniline dichloride hydrochloride, by the action of Cl on *p*-IC<sub>6</sub>H<sub>4</sub>NMe<sub>2</sub> in CHCl<sub>3</sub> at -12°, amorphous, decomps. 78-85°. Reduced in concd. HCl with H<sub>2</sub>S, an 80% yield of *o*-chloro-*p*-iododimethylaniline is formed, b<sub>18</sub> 159-61°, b. 276-8°. The hydrochloride is obtained by reduction in CHCl<sub>3</sub>. The constitution was established by reduction to *o*-ClC<sub>6</sub>H<sub>4</sub>NMe<sub>2</sub> by Zn and HCl.

C. J. WEST

New catalysts for the decomposition of diazo compounds. A. KORCZYNSKI, W. MROZINSKI AND W. VILAU. *Rocz. Chem.* 1, 140-6 (1921).—Salts of Ni and Co may be used instead of Cu salts in the Sandmeyer reaction. Both metals are not equally efficient in all Sandmeyer changes, thus the double K-Ni cyanide converts diazobenzene compds. into PhCN at the b. p. as efficiently as in the original Sandmeyer reaction, but Co compds. are not suited to this reaction. Co(SCN)<sub>2</sub> gives a good yield of PhSCN when boiled with diazobenzene compds., but Ni gives a very poor yield. The formation of PhCl from PhN<sub>2</sub>Cl is not efficiently catalyzed by CoCl<sub>2</sub>.

J. S. C. I.

Aromatic antimony compounds. V. Different behavior of lithium hydroxide, as compared with sodium and potassium hydroxide, in the hydration of the polymeric aristibinic acids. HANS SCHMIDT. *Ber.* 55B, 697-701 (1922); cf. C. A. 15, 505.—It had been found that the trimol. [(3PhSbO<sub>2</sub>)<sub>2</sub>H<sub>2</sub>O]·nH<sub>2</sub>O (A) dissolves in about 1 mol. NaOH, the soln. at first being neutral to phenolphthalein, but on standing the clear soln. uses up more NaOH and becomes permanently neutral to phenolphthalein only

when not quite 3 mols. NaOH have been added. Comparative expts. on the action of NaOH, KOH and LiOH on A and its *p*-Cl, *m*-NO<sub>2</sub>, 4,3-Cl(NO<sub>2</sub>) and *p*-NH<sub>2</sub> derivs. have now shown that whereas NaOH and KOH have the same hydrating action on A and its NH<sub>2</sub> deriv., much less LiOH is used up. If NaOH and KOH hydrolyze the polymeric acids to the monomol. form, then the action of LiOH must stop at an intermediate stage, probably  $(\text{PhSbO}_2)_3 = (\text{PhSbO}_2)_2 + \text{PhSbO}_2$ , judging from the amt. of LiOH neutralized. The Cl, NO<sub>2</sub> and Cl(NO<sub>2</sub>) derivs., on the other hand, are equally hydrated by the 3 alkalis.

C. A. R.

**The quadrivalence of tin in its mercaptides.** V. WUYTS AND A. VANGINDERTAELEN. *Bull. soc. chim. Belg.* 30, 323-8(1921).—Sn<sup>IV</sup> mercaptides can be prepd. (a) by the action of Sn and HCl on org. disulfides with subsequent neutralization, (b) from a thio alc. and SnCl<sub>4</sub> in presence of air, or (c) from a thio alc. and SnCl<sub>4</sub>. Attempts to prep. SnO mercaptides did not succeed, and the behavior of Sn in this respect is compared with that of its sulfides towards alkali sulfide solns. The mercaptide,  $\text{Sn}(\text{SC}_6\text{H}_4\text{NMe}_2)_4$ , prepd. from  $(\text{Me}_2\text{NC}_6\text{H}_4\text{S})_2$  is a red, cryst. substance, m. 159°; with BzCl in C<sub>6</sub>H<sub>6</sub> it forms the benzoate of the corresponding thio alc., m. about 136°; with MeI, two reactions take place, one with the rupture of the S-Sn linking and the combination of Me and I with the elements resp., the other with formation of the iodide of the quaternary NH<sub>4</sub> base,  $\text{NMe}_2\text{I} \cdot \text{C}_6\text{H}_4\text{SMe}$ . Similarly, from  $(p\text{-H}_2\text{NC}_6\text{H}_4\text{S})_2$ , the mercaptide,  $\text{Sn}(\text{SC}_6\text{H}_4\text{NH}_2)_4$ , red, leafy crystals, m. about 166°, was obtained.

J. C. S.

**Some reactions of nitric acid on phenols and the di-ethers of pyrocatechol and homopyrocatechol.** R. HUGGERS. *Bull. sci. pharmacol.* 29, 180-4(1922).—When 1 or 2 drops of guaiacol are shaken in 10 cc. of H<sub>2</sub>O and treated with 7 drops of HNO<sub>3</sub>, an intense red color is produced. Cresol similarly treated gives a yellow-orange, as does eugenol. Naphthol gives brown and thymol fails to yield any color. When HNO<sub>3</sub> is added to the di-ethers of pyrocatechol and homopyrocatechol their nitrated products cryst. out prettily.

F. S. HAMMETT

**Benzyl compounds.** J. MESSNER. *Pharm. Zentralkalle* 63, 1(1922).—The instability of aq. solns. of  $\text{PhCH}_2\text{OH}$  and  $\text{BzOCH}_2\text{Ph}$ , even in the absence of air, *e. g.*, when sealed up in ampoules, is ascribed to autoxidation, catalyzed possibly by traces of alkali from the glass. In the former case 1 mol. of the alc. is oxidized to BzH at the expense of a second which suffers reduction to PhMe. Aq. solns. of  $\text{BzOCH}_2\text{Ph}$  acquire a strong odor of BzH after a week or so, although remaining neutral in reaction. This is therefore not a case of hydrolysis, but of self oxidation and reduction according to the scheme:  $\text{PhCO}_2\text{CH}_2\text{Ph} \rightarrow \text{PhCHO} + \text{OHCPH}$ .

J. S. C. I.

**Chlorination of benzyl chloride.** S. C. J. OLIVIER. *Rec. trav. chim.* 41, 419-21 (1922).—Beilstein and Kuhlberg (*Ann.* 146, 320(1868)) reported the prepn. of *p*-ClC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Cl (A) by the chlorination of  $\text{PhCH}_2\text{Cl}$  (B) in the presence of I. In attempting to obtain A by this method O. treated 80 g. B + 0.100 g. I with the calcd. amt. of Cl<sub>2</sub> at 30-40°. The product was then washed, dried, fractionated and finally inoculated with B in an ice bath. The 3 fractions gave crystals that m. 50-9.5°, 43-51° and 37-9.5°, resp. The m. p. of *o*-ClC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Cl (C) from *o*-ClC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H prepd. electrolytically is 71° (preceding abstr.) and that of *p*-ClC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Cl (D) is 72°. When the crystals of fraction I are mixed with C the m. p. is raised while it is lowered with D. Fraction II behaved similarly while fraction III gave an elevation of the m. p. in both cases. It is therefore probable that C predominates in fractions I and II and the compn. of III lies close to the eutectic for C + D. Repeated recrystn. of fraction I gave pure C while fraction III gave impure D. The chlorination of A by this method probably gives mainly C, some D and the formation of the *m*-isomer is not excluded.

E. J. WITZEMANN

**Reciprocal induced polarity effects in cresols and their derivatives.** Properties

of isomeric methoxybenzyl bromides. ARTHUR LAPWORTH AND J. B. SHOKSMITH. *J. Chem. Soc.* 121, 1391-400(1922); cf. *C. A.* 16, 2047.—The agreement between the requirements of the principle of induced alternate polarities and the observed properties of the 3 cresols being so striking it was decided to direct attention to the possibility of demonstrating that such effects may be reciprocal and that the elements of the HO group—more particularly the O atom—may in turn affect the properties of the Me group in similar alternating manner. The study was made on the 3 MeOC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Br, prepn. of which will be described later. The *o*- and *p*-derivs. were expected to contain halogen with their natural negative polarity enhanced, while in the *m*-isomer the opposite was expected. The theory was tested by the rate of hydrolysis with alkali and the rate of reduction with HI. The exptl. results confirmed the theory, i. e., the *o*- and *p*-derivs. were acted upon by alkali much more quickly than the *m*-deriv. When emulsified with alkali 10, 20 and 33% of the *m*-deriv. were hydrolyzed in 24, 48, and 72 hrs., while in alc. soln. 13, 39, and 59% were hydrolyzed in 35, 155 and 315 min. with 0.02 *N* NaOH. The *o*- and *p*-derivs. were completely hydrolyzed in 5 min. In the case of the reaction with HI the reactivity should be the reverse of the above, which was also found by expt., 26.8% *o*-deriv. 5.8% of the *p*-deriv. and 99.8% *m*-deriv. being reduced in 195, 195 and 175 min., resp.

C. J. WEST

Decomposition of benzyl disulfoxide. J. A. SMYTHE. *J. Chem. Soc.* 121, 1400-5 (1922); cf. *C. A.* 8, 2367.—(PhCH<sub>2</sub>)<sub>2</sub>S<sub>2</sub>O<sub>2</sub>, heated at 150° in CO<sub>2</sub>, gave an av. of 15.3% of SO<sub>2</sub> (theory, 23%). The same amt. is formed when heated in Ac<sub>2</sub>O at 150° in a sealed tube. The other reaction products are (PhCH<sub>2</sub>)<sub>2</sub>S, (PhCH<sub>2</sub>)<sub>2</sub>S<sub>2</sub>, BzH, PhCH<sub>2</sub>-OAc and PhCH<sub>2</sub>COSMe. The ratio of ester to thio-ester decreases with increase of temp. (PhCH<sub>2</sub>)<sub>2</sub>S<sub>2</sub>O<sub>2</sub> and PhCH<sub>2</sub>SH react to give (PhCH<sub>2</sub>)<sub>2</sub>S<sub>2</sub> and H<sub>2</sub>O, when heated in Ac<sub>2</sub>O. SO<sub>2</sub> has no effect on PhCH<sub>2</sub>SH in Ac<sub>2</sub>O. Benzyl thioacetate, limpid liquid, b. 248°.

C. J. WEST

Action of nitrogen iodide and cyanogen iodide on benzamidine. PAUL ROBIN. *Compt. rend.* 173, 1085-6(1921); cf. *C. A.* 15, 1703, 3469.—A suspension in H<sub>2</sub>O of N iodide gives with PhC(:NH)NH<sub>2</sub>.HCl (A) and alkali, *N*-iodobenzamidine (B). Under similar conditions, ICN and A gave no B, but an addition product, fine white needles, m. 72° (decompn.) and smelling of ICN. This product is not recrystallizable, and liberates I<sub>2</sub> quant. with KI soln.

BEN H. NICOLET

4-Nitrosalicylic acid. H. KONDO, T. NAKAJIMA AND G. MURAKAWA. *J. Pharm. Soc. (Japan)* No. 483, 355-69(1922).—Ullmann and Uzbachian (*Ber.* 36, 1801(1903)), reported that 4,2-O<sub>2</sub>N(AcNH)C<sub>6</sub>H<sub>3</sub>Me (A) undergoes a rearrangement to 5,2-O<sub>2</sub>N-(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H when oxidized by Ca(MnO<sub>4</sub>)<sub>2</sub> or KMnO<sub>4</sub>. This conclusion was based on the fact that the purified acid m. 221°, which is nearly the same as the m. p. (214-6°) of 5,2-O<sub>2</sub>N(AcNH)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (B) reported by Seidel and Bittner (*Monatsh.* 23, 435) and that the O<sub>2</sub>N(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H prepd. from it m. 269.5°, which is the same as that reported by Rhalis (*Ann.* 148, 112). According to S. and B., this acid m. 280°. On account of this uncertainty, K., N. and M. repeated similar expts., using U.'s method. 4,2-O<sub>2</sub>N(AcNH)C<sub>6</sub>H<sub>3</sub>Me → O<sub>2</sub>N(AcNH)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (m. 221°) → O<sub>2</sub>N(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (decomp. 263-4°; according to U., 269.5°) → Et ester (m. 97-8°) → O<sub>2</sub>N-(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (m. 234-5°) → Et ester (m. 86-7°). Next O<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H was reduced by the elec. current in dil. HCl (Pb as electrodes) to the HCl salt (m. 222-3°) of H<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H, decomp. 145-51°. On the other hand, they have followed S. and B.'s method: β-nitrophthalimide → 4- and 5-nitroanthranilic acids which were sepd. by hot xylene and purified with 80% alc. These two acids were converted as above to the corresponding H<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H and compared with those prepd. from the toluidine derivs. Pure salicylic acid was also directly nitrated and this 5-nitrosalicylic acid compared with the above acids. The conclusion is that A does not re.

arrange to B on oxidation, and that the U. method is one of the easiest methods of prepn. of 4,2-O<sub>2</sub>N(H<sub>2</sub>N)C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H and therefore of 4-nitro- or 4-aminosalicylic acid.

S. T. —

**Catalytic racemization of optically active acid amides.** ALEX. MCKENZIE AND ISOBEL AGNES SMITH. *J. Chem. Soc.* 121, 1348-61(1922); cf. *C. A.* 14, 3220.—*l*-PhHC(OH)CONH<sub>2</sub>, prepd. from the Et ester in CS<sub>2</sub> and NH<sub>4</sub>OH satd. at 0° gave  $[\alpha]_D -95.5^\circ$  in H<sub>2</sub>O,  $-59.2^\circ$  in EtOH and  $-74.8^\circ$  in AcMe. Hydrolyzed with 2 mols. aq. KOH, the acid liberated had  $[\alpha]_D -30^\circ$ , considerably less than for the *l*-acid. When 0.5 mol. KOH was used, the amide recovered had  $[\alpha]_D -7.7^\circ$  in H<sub>2</sub>O. With EtOH-KOH, and the acid the recovered amide were inactive. The addn. of a very small amt. of EtOH-KOH caused the rotation to drop gradually to 0°, at which stage the soln. was still alk. and contained the *dl*-amide. The initial rise in activity when EtOH-KOH is added to the amide may have its cause in a combination of amide and EtOK. *l*-Atrolactamide, glassy, rhombic plates from C<sub>6</sub>H<sub>6</sub>, m. 62.5-3.5°; in AcMe  $[\alpha]_D 12.8^\circ$ , in EtOH, 12.6°. Upon hydrolysis, the acid is recovered unracemized. In the case of *l*-MeOCHPhCONH<sub>2</sub>, the partial hydrolysis with 0.5 the calcd. quantity of alc. KOH gave inactive acid and amide. The rate is much more rapid than in the case of *l*-PhCH(OH)CONH<sub>2</sub>. *dl*-Phenyl-*p*-tolylacetamide, needles from EtOH, m. 155.5-6.5°. The *l*-derivative forms feathery needles m. 150.5-1.5°, and shows  $[\alpha]_D -2.2^\circ$  in EtOH and  $-1.9^\circ$  in AcMe. It is completely racemized in 10 min. by alc. KOH. *l*-HOCHPhCONHEt is racemized very slowly by alc. KOH at room temp. *l*- $\beta$ -Hydroxy- $\beta$ -phenylpropionamide m. 105-6° and in EtOH shows  $[\alpha]_D -39.5^\circ$ . Neither this nor the *d*-deriv. is racemized by alc. KOH, nor are *d*-tartramide and *l*-maldiamide. Both *l*-monomethoxysuccinamide and *d*-dimethoxysuccinamide are gradually racemized while *d*-monoethoxysuccinamide appears to be stable. The possible mechanism of the racemization is discussed.

C. J. WEST

**The addition of bromine to substituted trans-cinnamic acids. I. The monosulfocinnamic acids.** C. F. VAN DUIN. *Rec. trav. chim.* 41, 402-18(1922).—Little work has been done on the velocity of addn. of Br to unsatd. compds. (Hofmann and Kirmreuther, *C. A.* 4, 589). Sudborough and Thomas (*C. A.* 1, 730) have measured the velocity of Br addn. to cinnamic acid and its esters but the influence of the nature and position of substituents has never been examd. The results here described represent a partial study of the monosulfocinnamic acids from this point of view. Allocinnamic acid is the *cis*-isomer (Stoermer and Heymann, *C. A.* 7, 1013) while the one that m. 133° is the *trans*-form, but both on sulfonation with oleum (cf. S. and H.) give the *o*- and *p*-sulfo derivs. of the *trans*-form. *p*-Sulfocinnamic acid (A) was prepd. by Moore's method (*J. Am. Chem. Soc.* 25, 622(1903)) by adding 150 g. powdered cinnamic acid in portions to 450 cc. oleum (17.5% SO<sub>3</sub>) at temps. below 50° and finally heating on the H<sub>2</sub>O bath 15 mins. After cooling 720 cc. H<sub>2</sub>O were added, A was filtered off after 24 hrs. and washed with 25% H<sub>2</sub>SO<sub>4</sub> (by vol.). A 70% yield of A was obtained. The Na, Ba and acid PhNH<sub>2</sub> salts of A were prepd. A in concd. aq. soln. treated with a slight excess Br<sub>2</sub> and then with concd. NaCl pptd. the acid salt of *p*-HO<sub>3</sub>SC<sub>6</sub>H<sub>4</sub>CHBrCHBrCO<sub>2</sub>H with 3H<sub>2</sub>O of crystn. The filtrate from A was neutralized with BaCO<sub>3</sub>, the BaSO<sub>4</sub> filtered off and the filtrate evapd. to a small vol. The Ba salt of A sepd. and was filtered off. HCl was added to the filtrate and pptd. the acid Ba salt of *o*-sulfocinnamic acid (B), [HO<sub>3</sub>CCH:CHC<sub>6</sub>H<sub>4</sub>(SO<sub>3</sub>)<sub>2</sub>]<sub>2</sub>Ba. 1.5H<sub>2</sub>O. The Na salt, obtained with Na<sub>2</sub>SO<sub>4</sub>, treated with excess of bromate and bromide and HCl adds the calcd. amt. of Br. The Na, Ba and acid PhNH<sub>2</sub> salt of B are more sol. than those of A, but the latter cryst. much better. The structure of B was proved by converting it into *o*-ClCOC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>Cl by oxidation with KMnO<sub>4</sub> and then treating with PCl<sub>5</sub>. With PCl<sub>5</sub> B gave the dichloride and this with NH<sub>3</sub> gave the diamide of B, which when oxidized



with  $\text{KMnO}_4$  gave pure  $o\text{-HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{NH}_2$ , m.  $153-5^\circ$ , thus showing that B was pure. That none of the *m*- or *p*-isomers was present was indicated by the easy soly. of the product at room temp. *m*-Sulfocinnamic acid (C) was synthesized by Perkins' method (Kafke, *Ber.* 24, 796(1890)) from the Na salt of  $m\text{-HO}_2\text{SC}_6\text{H}_4\text{CHO}$  (D). The C obtained absorbed the calcd. amt. of Br, giving  $m\text{-HO}_2\text{SC}_6\text{H}_4\text{CHBrCHBrCO}_2\text{H}$ . The prepn. of D was improved (Wallach, Wüster, *Ber.* 16, 150(1883)): 20 cc.  $\text{BzH}$  were added drop by drop with agitation without cooling to 100 g. oleum (32%  $\text{SO}_3$ ) and the temp. rose to  $65^\circ$ . The mixt. was then heated 10 mins., cooled and poured into  $\text{H}_2\text{O}$ . The Ba salt was isolated as usual and purified by recrystn. from dil.  $\text{EtOH}$ . Yield, 60-70%. The detns. of the velocity of addn. of Br to A, B and C were made with the normal and acid Na salts in  $\text{H}_2\text{O}$ . Other solvents could not be used because of the low soly. of the anhydrous compds. The expts. were carried out as previously described (Kruyt and v. D., *C. A.* 15, 3783). The results showed that in the presence

$\text{CO}_3^{+}$

of variable amts. of HCl the addn. of Br to the 2 ions  $\text{R}(\text{CO}_2\text{H})\text{SO}_3^{+}$  and  $\text{R}-\text{SO}_3^{+}$  is represented by a bimol. equation and the difference in the course for the acid and normal salts is due to the difference in the velocity of reaction of these ions: a negative catalysis due to  $\text{H}^{+}$  ions was not noticed. The small changes in the consts. associated with large changes in the HCl concn. are probably due to changes of the medium. The velocity of reaction with the normal salts is so great that only the latter part of the reaction could be measured, so that these data are not accurate. With both ions the addition of Br is fastest with the *m*-isomer and least with the *p*-isomer so that steric hindrance is not involved as in the esterification of  $o\text{-HO}_2\text{CC}_6\text{H}_4\text{SO}_3\text{H}$  (v. D., *C. A.* 16, 1228). The position of the substituent is of secondary importance in comparison with the strong retarding effect that it has on Br addn. Thus Barrett and Lapsworth found  $K_0 > 1000$  for cinnamic acid while for A, B and C  $K_0$  is 27-52. The velocity of Br addn. to A was not appreciably influenced by diffuse sunlight. The great diminution of the velocity of Br addn. by the influence of HBr is probably due to the formation of  $\text{Br}_2^{+}$  ions since the addition of equiv. amts. of  $\text{H}^{+}$  ions as HCl increases the velocity greatly. A comparison of the velocity of Br addn. and the velocity of transformation by KI for the 2 ions of A and the di-Br deriv. shows that the ion that fixes Br most rapidly reacts as the di-Br deriv. most slowly with KI and *vice versa*. More details concerning this will be published later.

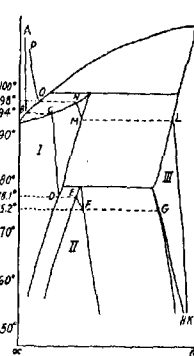
E. J. WITZEMANN

**Benzopyrylium salts of distyryl ketones.** I. J. S. BUCK AND I. M. HEILBRON. *J. Chem. Soc.* 121, 1198-1212(1922).—*2'-Hydroxy-2-styrylbenzopyrylium chloride* (*C. A.* 3, 61) is stable when prepd. by the use of  $\text{HCO}_2\text{H}$  as solvent (not  $\text{AcOH}$ ) and crysts. with 0.5 HCl, which is very slowly lost. *Ferric chloride salt*, dull red masses of glistening needles, m.  $178^\circ$ . *Perchlorate*, maroon-colored crystals, m.  $196^\circ$ . *3'-Hydroxy-2-styrylbenzopyrylium chloride*, prepd. by satg. 3',2-dihydroxydistyryl ketone in  $\text{HCO}_2\text{H}$  with dry HCl at room temp., reddish black prismatic clusters with 1 mol.  $\text{HCO}_2\text{H}$  of crystn. *4'-Hydroxy derivative*, from  $p\text{-HOC}_6\text{H}_4\text{CHO}$  and  $o\text{-HOC}_6\text{H}_4\text{CH:CHCOMe}$ , brilliant blue microneedles, sol. in  $\text{H}_2\text{O}$  with deep red color, which changes on diln. to a pure blue. *3'-Methoxy derivative*, small, brick-red prisms, giving golden yellow solns. in  $\text{H}_2\text{O}$  or  $\text{EtOH}$ . *4'-Methoxy derivative*, violet-black crystals with indigo reflex, m.  $127^\circ$ . *Perchlorate*, glistening violet prisms, m.  $228^\circ$ . *Ferric chloride salt*, deep violet, glistening crystals with 0.5  $\text{C}_6\text{H}_4$ . *2',4'-Dihydroxy derivative*, long slender bronze-green needles, giving a deep reddish violet soln. in  $\text{EtOH}$ . *2',5'-Dihydroxy derivative*, dull greenish black powder, which forms a tar when heated to  $110^\circ$ . *3',4'-Dihydroxy derivative*, small prisms of beetle-green sheen. *2',4',7'-Trihydroxy derivative*, hygroscopic, deep purple needles, with dull green sheen, giving a deep purple-red soln.

in  $\text{H}_2\text{O}$ . *3'-Methoxy-4'-hydroxy derivative*, prepd. in 80%  $\text{HCO}_2\text{H}$ , dull, greenish black powder, decomp.  $145^\circ$ . The aq. soln. becomes pure blue on diln. *3',4'-Methylene-dioxy deriv.*, may cryst. with  $1\text{H}_2\text{O}$  and 0.5 HCl from  $\text{HCO}_2\text{H}$  or with  $1\text{H}_2\text{O}$  from  $\text{AcOH}$ .  $\text{FeCl}_3$  salt, small, greenish brown prismatic needles, m.  $203^\circ$ . *Perchlorate*, small green crystals. *3',4'-Dimethoxy derivative*, glistening emerald-green crystals with characteristic sheen, m.  $116-8^\circ$ . A 2nd form is obtained by working in more concd. soln., brilliant beetle-green mass with golden sheen, m.  $93^\circ$ , decomp.  $116^\circ$ ; this contains  $1\text{HCO}_2\text{H}$  and  $1\text{H}_2\text{O}$ . A table shows the colors of the crystals and solns. in  $\text{EtOH}$  and in  $\text{H}_2\text{O}$  (concd. and at high diln.), reaction with  $\text{FeCl}_3$  and color on tanned cotton

C. J. WESS

**Configuration of annular systems in space.** H. G. DERR. *Rec. trav. chim.* 41, 312-43 (1922).—The basis of this work was the observation of Böeseken and van Giffen (*C. A.* 14, 2472), in an attempt to det. the configuration of the *cis*- and *trans*-*o*-cyclohexanediols (A), that neither of the isomers increases the cond. of  $\text{H}_2\text{BO}_3$ . van Loon's experience (*Thesis*, Delft, (1919); cf. *C. A.* 15, 237) had shown that of the cyclopentane-diols (B) only the *cis*-isomer increased the cond. B. and v. G. (*l. c.*) attributed this difference in the isomers of A and B to a certain flexibility of the hexatomic ring in A and D. undertook to det. the cause of this flexibility. In order to do this he extended his expts. to the *o*-diols of tetrahydronaphthalene (C) and to the cycloheptane-diols (D). The work on these compds. is simplified by v. L.'s discovery of the  $\text{Me}_2\text{CO}$  derivs. of the *cis*-diols which B. and D. (*C. A.* 15, 3629, 3631) have also used to sep. the *cis*- from the *trans*-diols. After briefly reviewing Baeyer's views on rings and his strain theory D. cites Hückel's (*C. A.* 14, 3670) data on the energy content of polymethylene rings as proving that there is no strain in 5-, 6- and 7-C atom rings. The objection of Sachse and others that there would then be 2 hexahydrobenzoic acids, etc., is met by D. by accepting the possibility and suggesting that these isomers have a stability that depends on the external conditions which are not known in most cases. By building up models that can scarcely be described, but which are illustrated by photographic reproductions, and representing the C atom with balls and their valences by rods, D. found it easy to demonstrate the phenomena of rigidity and flexibility in C rings. From the increase in cond. that occurs with certain poly-OH compds. in the presence of B- (OH), Böeseken concluded that annular acids,  $\text{C.O.B(OH).O.C}$ , are formed. Fischer found that certain poly-OH



compds. with dry  $\text{Me}_2\text{CO} + \text{HCl}$  gas give internal di-ethers,  $\text{C.O.CMe}_2\text{O.C}$ ,

which are stable in aq. alk. soln. but easily decompd. in acid soln. In both cases a pentatomic ring with 2 O atoms is involved in which all 5 atoms are probably in a plane because it is only formed when there is no resistance. In the alicyclic diols this resistance can be due to the attachment of the OH groups to the ring and cases can exist with which neither  $\text{H}_2\text{BO}_3$  nor  $\text{Me}_2\text{CO}$  can unite. In the aliphatic open-chain diols the resistance cannot be so great owing to rotation of atoms on axes by which the mutual repulsion of OH groups can be exercised. In this case a  $\text{H}_2\text{BO}_3$  compd. is not formed but  $\text{Me}_2\text{CO}$  gives a deriv. if a dehydrating agent is added. All allylic *cis*-diols give  $\text{Me}_2\text{CO}$  derivs. but the formation of the  $\text{Me}_2\text{CO}$  deriv. of the *trans*-form depends on the freedom of rotation of the OH groups in this diol. The action

of  $H_2BO_3$  cannot be predicted except to say that if the  $Me_2CO$  deriv. is not obtained a  $H_2BO_3$  deriv. will not be formed. These statements apply only to simple diols and the aromatic diols are not included. van Loon (*l. c.*) based his study of B and hydrindenediols on the supposition that the cyclopentane ring lies in a single plane and is rigid. The position in space of the OH groups which depends mainly on the position of the C atoms in the ring is thus fixed because the ring is fixed. In these compds. the position of the OH groups in the *cis*-form is always favorable to the formation of  $H_2BO_3$  and  $Me_2CO$  derivs. because the OH groups are in a plane with the 2 C atoms to which they are bound. With the *trans*-forms conditions are unfavorable because the directions of the valences C.OH are never in a plane. The 2 diols of A m.  $98^\circ$  and  $104^\circ$ , resp. The isomer m.  $98^\circ$  exists in 3 enantiotropic forms whose transition points are  $75.2^\circ$  and  $78.1^\circ$ , and gives an  $Me_2CO$  deriv. (b.  $182^\circ$ , m.  $-6.5^\circ$ ) but does not increase the cond. of  $H_2BO_3$ . The isomer m.  $104^\circ$  is known in but one form and interacts with neither  $H_2BO_3$  nor  $Me_2CO$  but gives 2 optical isomers that m.  $110.5^\circ$  and give  $[\alpha]_D 41^\circ 16'$ . According to v. L. (*l. c.*) the *cis*-diol m.  $98^\circ$  and the *trans*-diol  $104^\circ$ . From his model D. obtains an  $\alpha$ -arrangement, in which 4 C atoms exist in one plane and 2 are above this plane, which is flexible and ought to undergo intramol. movements. The  $\beta$ -arrangement is the sym. arrangement of Sachse in which the 6 C atoms taken alternately lie in 2 planes and is rigid and nonflexible. The substituents are therefore also rigid. Since the OH groups are so far apart in both the *cis*- and *trans*-forms of the  $\beta$ -arrangement neither increases the cond. of  $H_2BO_3$ . In fact they decrease it and the *cis*- does so a little more than the *trans*-diol. However with  $Me_2CO$  and HCl gas the *cis*-diol alone gives the  $Me_2CO$  deriv., which proves that at least in an  $Me_2CO$  medium part of the *cis*-form occurs in the flexible  $\alpha$ -arrangement for only in this arrangement (but only of the *cis*-diol) are the adjacent C.OH groups both in one plane. In the *trans*-form of the arrangement these groups are crossed. Owing to the fact that the position of the equil.  $\alpha$ -arrangement  $\rightleftharpoons \beta$ -arrangement depends on the conditions it is probable that at higher temps. A will produce an increase in the cond. of  $H_2BO_3$ . Owing to the flexibility of the *cis*-form D. considers that the sepn. of 2 optical isomers constitutes proof that it was the *trans*-form that was sepd. D. discusses the dynamic isomerism of A in terms of Smits' hypothesis of polymorphism of org. compds. in which he extended the dynamic isomerism of the liquid state to the solid state. In the diagram it is considered that fused A is mostly the flexible  $\alpha$ -form in equil. with the rigid  $\beta$ -form. In cooling  $A \rightarrow B$  the liquid begins to cryst. at B, giving a mixt. of compn. C. The heat liberated in crystn. is in part the heat of transformation of  $\alpha$  into  $\beta$ -mols. The compn. of the cryst. mass does not remain unchanged but follows  $C \rightarrow D$  to  $78.1^\circ$  where mixts. of  $\alpha$  and  $\beta$  sep. having the compn. D and E. If the temp. falls these crystals are transformed into another anisotropic system II, i. e., polymorphism occurs for the 1st time. The crystals do not remain as II long but at  $75.2^\circ$  repeat the phenomenon along E and F giving finally an anisotropic mixt. in the rhombic form III which is stable at ordinary temps. In cooling from  $100^\circ$  to  $50^\circ$  the compn. of the cryst. mass follows the line ABCDEFGH and at ordinary temp. A is mostly the  $\beta$ -form. By a microscopic examn., that is described in detail, it was found that II is not observed between  $25^\circ$  and  $100^\circ$  due to restricted mobility in the crystn. system. The equil. that takes place in heating instead of following the line HGFED etc., follows the line KLMNOP. The points of transformation were detd. by the thermal method and microscopically. D. suggests that this hypothesis be accepted with the necessary reserve. The internal mobility of the 6-C-atom ring is discussed in terms of the 4 *o*-tetrahydronaphthalenediols (D). Of these the *cis*-1,2-isomer (E) m.  $102^\circ$ , gives an  $Me_2CO$  deriv. that b.  $105^\circ$  and increases the cond. of  $H_2BO_3$ . Its *trans*-isomer (F), m.  $112-3^\circ$ , gives a trace of an  $Me_2CO$  deriv. and diminishes the cond. of  $H_2BO_3$ . The *cis*-2,3-isomer (G), m.

120°, gives a cryst.  $\text{Me}_2\text{CO}$  deriv. that m. 78–9° and diminishes the cond. of  $\text{H}_2\text{BO}_3$ . Its *trans*-isomer (H), m. 135°, gives a trace of a  $\text{Me}_2\text{CO}$  deriv. and diminishes the cond. of  $\text{H}_2\text{BO}_3$ . So far the results conform with those obtained with A but D. concludes that the relations with D are too complicated to permit of satisfactory conclusions concerning the distribution of the atoms of the ring in space until more data are obtained. In forming a model of the ring with 7 C atoms it is evident at once that annular tension is not required if the C atoms are free to distribute themselves in space according to the stereometric laws guided by the angle  $109^\circ 28'$  between the directions of the valences of the C atom. As with the hexatomic rings 2 positions can be distinguished but both are flexible and this therefore has less influence on their behavior with  $\text{H}_2\text{BO}_3$  and  $\text{Me}_2\text{CO}$ . Both the *cis*- and *trans*-forms of D give  $\text{Me}_2\text{CO}$  derivs. (Bösesken and D., C. A. 15, 3831) and therefore this fails to distinguish the 2 isomers. Both isomers increase the cond. of  $\text{H}_2\text{BO}_3$  and the *cis*-form m. 46° has a larger effect than the *trans*-form. These facts constitute the 1st expl. proof that in a ring with more than 5 atoms the atoms are no longer in a plane and consequently there is no annular tension. The general method used in the prepn. of the 7  $\text{Me}_2\text{CO}$  derivs. of diols referred to above is described. The prepn. of internal oxides of unsatd. hydrocarbons (Prileschaieff, C. A. 4, 918) is also described. In sepg. the optical isomers of *trans*-cyclohexanediol D. did not use the menthyl derivs. (v. Loon, Thesis, Delft, (1919); cf. C. A. 15, 237) but used Meth's method (C. A. 1, 1264), which is described in detail. The free *d-trans*-o-cyclohexanediol was finally obtained as hexagonal bipyramidal crystals, m. 110.5°,  $[\alpha]_D^{20}$  41°16'. The *l*-form was not examd. Some additional notes on the prepn. of the tetrahydronaphthalenediols and additional details in the prepn. of the cycloheptane-1,2-diols (cf. B. and D., C. A. 15, 363) are given.

E. J. WITZEMANN

Intermolecular condensation of methyl ethyl ketone in the presence of calcium carbide. OSCAR BRÜCKER AND J. F. THORPE. J. Chem. Soc. 121, 1303–6(1922).—The condensation of  $\text{MeEtCO}$  by  $\text{CaC}_2$  (Bodronx and Taboury, Bull. soc. chim. [4] 3, 831) results in the formation of  $\Delta^6$ -hepten- $\gamma$ -one, b. 164–6°. With Na and  $\text{CH}_3\cdot(\text{CO}_2\text{Et})_2$  this yields ethyl 1,4-dimethyl-1-cyclohexane-3,5-dione-2-carboxylate, clear, viscid liquid which could not be distd., and which gave a deep red color with  $\text{FeCl}_3$ . Boiled with aq.  $\text{Ba}(\text{OH})_2$ , 1,4-dimethyl-1-ethylcyclohexane-3,5-dione results, glistening scales, m. 113–4°. This is unstable and rapidly passes to a resin on standing. The constitution of the dione was established by oxidation to  $\text{HO}_2\text{CCH}_2\text{CMeEtCH}_2\text{CO}_2\text{H}$ .

C. J. WEST

Dyes derived from camphoric anhydride. A. C. SIRCAR AND SIKHIBHUSAN DUTT. J. Chem. Soc. 121, 1283–6(1922).—The best condensing agent for these compds. is formed by dissolving pure  $\text{ZnO}$  or  $\text{ZnCO}_3$  in concd.  $\text{HCl}$ , evapg. to dryness and heating in dry  $\text{HCl}$  at 200° for 0.5 hr. Resorcinolcamphorein, by heating camphoric anhydride, resorcinol and  $\text{ZnCl}_2$  at 180° for 3 hrs., reddish brown powder, does not m. 290°. The  $\text{NaOH}$  soln. is deep red with green fluorescence on diln. The Na salt dyes wool a brick-red. Tetrabromo derivative, brown spangles with golden green, metallic luster, which shows a moss-green fluorescence in dil.  $\text{NaOH}$  soln. The Na salt dyes wool and tannin-mordanted cotton a brilliant pink. *m*-Dimethylaminophenolcamphorein, bright violet-red flocks, does not m. 285°; hydrochloride, glistening green prisms, m. 125–6°. The alc. soln. shows an orange fluorescence and the salt dyes pink shades on wool and reddish violet shades on tannin-mordanted cotton. Phloroglucinolcamphorein, orange-red micro-needles; the Na salt dyes wool orange shades. A second product forms long yellow needles, m. 195°. *m*-Aminophenolcamphorein, dark brown powder, m. 210° (decompn.), which exhibits a green fluorescence in soln. *m*-Phenylenediaminecamphorein, brownish yellow prisms with silky luster, m. 234° (decompn.), which show a green fluorescence in soln.

C. J. WEST

**Optically active dyes. I. Camphoreins.** B. K. SINGH, RAGHUNATH RAI AND RATTAN LAL. *J. Chem. Soc.* 121, 1421-30(1922).—These dyestuffs may be classed as acid mordant dyes and belong to the  $\text{CH}_2\text{Ph}_3$  series. They belong to the class of diffusible dyes and can act as stains for animal or vegetable cells. *Phenolcamphorein*,  $\text{C}_{20}\text{H}_{20}\text{O}$ , from  $\text{PhOH}$  and camphoric anhydride when heated with  $\text{SnCl}_4$ , reddish brown mass, m.  $84^\circ$ , and dyes wool and silk yellow with Cr and Fe mordants. At a higher temp. ( $120-5^\circ$ ) the *anhydride* results, dark brown, m.  $120-3^\circ$ ; it shows a green fluorescence in  $\text{AcOH}$ . *o-Cresolcamphorein*, reddish brown, m.  $78-80^\circ$ , sol. in alkali with pink color changing to yellow on neutralization. In  $\text{EtOH}$   $[\alpha]_D^{25} 93^\circ$  and  $[\text{M}]_D^{25} 353^\circ$ . It is not a good dye. *Diacetate*, yellow, m.  $68-70^\circ$ ;  $[\alpha]_D^{25} 67^\circ$ ,  $[\text{M}]_D^{25} 309^\circ$ . *Dibromo derivative*, yellow, m.  $125^\circ$ . The *anhydride* is dark brown, m.  $125-30^\circ$ , and shows green fluorescence in  $\text{AcOH}$ . *Quinolcamphorein* is a yellowish brown powder, m.  $115-20^\circ$ . It has very little dyeing properties. *Catecholcamphorein*, prep'd. by using  $\text{ZnCl}_2$ , dark red, m.  $128-38^\circ$ ; the  $\text{H}_2\text{SO}_4$  soln. exhibits green fluorescence. *Phloroglucinolcamphorein*, prep'd. with a drop or two of conc'd.  $\text{H}_2\text{SO}_4$  as condensing agent, orange-yellow, m.  $215-8^\circ$ . *Pyrogallolcamphorein*, deep reddish brown, m.  $155-8^\circ$ ; it seps. from dil.  $\text{AcOH}$  with 0.5 mol.  $\text{H}_2\text{O}$ . It dyes wool in deep brown shades on Cr, Al, Sn and Fe mordants. *Tetraacetate*, light brown, m.  $92-4^\circ$ . *Tetrabromoresorcinolcamphorein* (camphoreosin), reddish yellow powder, m.  $133-5^\circ$ . Absorption curves are given.

C. J. West

Again the "colophenic acids." W. FAHRION. *Ber.* 55B, 709(1922).—Reply to Aschan (*C. A.* 16, 2135).

C. A. R.

**Disalicylic acid or anhydrosalicylic acid and its transformation into xanthone-4-carboxylic acid.** RICHARD ANSCHÜTZ AND WALTER CLAASSEN. *Ber.* 55B, 680-9 (1922).—To test the suggestion that when acetylsalicylic anhydride and aspirin are heated *in vacuo* disalicylic anhydride (A) is possibly first formed (*C. A.* 14, 1981), it became necessary to synthesize *disalicylic* or *anhydrosalicylic acid* (B), convert it into A and study the behavior of A on heating *in vacuo*. The synthesis of B was readily effected but when it is treated with  $\text{AcCl}$  or its dichloride is treated with anhyd.  $(\text{CO}_2\text{H})_2$ , they give, instead of the expected A, the isomeric *xanthone-4-carboxylic acid* (C), also obtained from B with conc'd.  $\text{H}_2\text{SO}_4$ . Nevertheless, these results do not necessitate giving up the assumption that B is formed when aspirin is heated *in vacuo*; to obtain it, it is necessary to start from substances already contg. the anhydride grouping  $\text{O}:\text{C}:\text{O}:\text{C}:\text{O}$ , as  $(o\text{-AcOC}_6\text{H}_4\text{CO})_2\text{O}$ ; such a comp'd. should give A if it were possible to split out  $\text{Ac}_2\text{O}$  at temps. at which no disalicylides are yet formed. *o-(o-MeC\_6H\_4O)\_2C\_6H\_4CO\_2H*, m.  $133.5^\circ$ , is obtained in 45 g. yield from 50 g.  $o\text{-ClC}_6\text{H}_4\text{CO}_2\text{K}$  by Ullmann and Zlokasoff's method (*Ber.* 38, 2111(1905)); 11.4 g. with 2.8 g. KOH in 100 cc.  $\text{H}_2\text{O}$  treated in the course of 9 hrs. with 17.6 g.  $\text{KMnO}_4$  in 280 cc.  $\text{H}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath, filtered, decolorized with  $\text{SO}_2$  and ppt'd. with conc'd. HCl gives almost quant. B, needles from  $(\text{CHCl}_3)_2$ , m.  $230^\circ$  (decompn.); *disilver salt*, cryst. ppt.; *calcium salt*, granular cryst. ppt. with  $\text{H}_2\text{O}$ ; *copper salt*, pale green ppt.; *dichloride*, from B in  $(\text{CHCl}_3)_2$  suspension with  $\text{PCl}_5$ , needles from  $(\text{CHCl}_3)_2$ , m.  $161^\circ$ ; *dimethyl ester*, from B in  $N$  KOH shaken 1 hr. with  $\text{Me}_2\text{SO}_4$ , needles from  $\text{MeOH}$ , m.  $65.5^\circ$ ; *ethyl ester*, from the chloride and  $\text{EtOH}$ , b.p.  $220^\circ$ ; *diamide*, from the chloride in  $(\text{CHCl}_3)_2$  with dry  $\text{NH}_3$ , needles from  $\text{PhNO}_2$ , m.  $265^\circ$ ; *dianilide*, from  $\text{PhNH}_2$  in  $\text{CHCl}_3$  with the chloride in  $(\text{CHCl}_3)_2$ , 4-sided leaflets from alc., m.  $194-5^\circ$ . C (*diphenylketoneoxide-4-carboxylic acid*), obtained almost quant. from 11 g. B heated to  $170^\circ$  with 50 cc.  $\text{AcCl}$ , felted needles from  $\text{PhNO}_2$ , m.  $289^\circ$ , also obtained by heating B 5-10 min. at  $150^\circ$  with  $\text{H}_2\text{SO}_4$  or the dichloride in  $(\text{CHCl}_3)_2$  with the calcd. amt. of anhyd.  $(\text{CO}_2\text{H})_2$  at  $145^\circ$ ; it dissolves in cold conc'd.  $\text{H}_2\text{SO}_4$  with yellow-green color and strong fluorescence and is rep'td. by  $\text{H}_2\text{O}$ ; it dists. under atm. pressure without decompn. *Silver salt*, cryst. ppt.; *calcium salt*; *copper*

*salt*, dark green ppt. with  $\text{H}_2\text{O}$ ; *chloride*, from C in  $(\text{CHCl}_3)_2$  suspension warmed with  $\text{PCl}_5$  or  $\text{SOCl}_2$  until dissolved, crystals from  $(\text{CHCl}_3)_2$ , reconverted into C by heating with 1 mol. anhyd.  $(\text{CO}_2\text{H})_2$ ; *methyl ester*, from C is somewhat more than the calcd. amt. of 0.1 N KOH shaken 2 hrs. with  $\text{Me}_2\text{SO}_4$ , long, somewhat yellowish needles from MeOH, m.  $146.5^\circ$ ; *ethyl ester*, from the Ag salt heated with EtI, yellowish microneedles from alc., m.  $123^\circ$ ; *amide*, insol. in all solvents, m. above  $320^\circ$  (decompu.); *anilide* needles from alc.

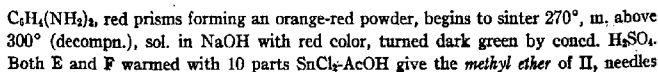
C. A. R.

The conditions underlying the formation of unsaturated and cyclic compounds from halogenated open-chain derivatives. IV. Products formed from halogen derivatives of muconic acid. The constitution of muconic acid. J. P. C. CHANDRASENA AND C. K. INGOLD. *J. Chem. Soc.* 121, 1306-19(1922); cf. C. A. 16, 912.—Muconic acid, prepd. by a no. of different methods, always m.  $305^\circ$ , gave an Et ester, m.  $64^\circ$ , and a Me ester, m.  $159^\circ$ . The Et ester is best prepd. by warming a mixt. of 150 g. acid and 500 g.  $\text{PCl}_5$  till the evolution of HCl ceases and then adding to 1500 cc. abs. EtOH. The oxidation of the dibromide (A) with  $\text{KMnO}_4$  soln. containing an excess of  $\text{MgSO}_4$  gave *ethyl  $\alpha,\beta$ -dibromo- $\gamma,\delta$ -dihydroxyadipate* (B), which could not be distd. This establishes the formula of the dibromide as  $\text{EtO}_2\text{CCHBrCHBrCH}:\text{CHCO}_2\text{Et}$ . On hydrolysis of the ester with concd. HCl,  *$\alpha$ -bromo- $\gamma,\delta$ -dihydroxy- $\Delta^a$ -dihydromuconic lactone* results, spear-shaped needles, m.  $157^\circ$ . Oxidation of A or B in AcMe with  $\text{KMnO}_4$  gave  $\text{HO}_2\text{CCBr}:\text{CHCO}_2\text{H}$  and  $(\text{CO}_2\text{H})_2$ . The action of 2 N aq. NaOH upon A gave  *$\alpha$ -bromomuconic acid*, small prisms, m.  $185^\circ$ . It decolorizes alk.  $\text{KMnO}_4$  but does not give AgBr with  $\text{AgNO}_3$  and  $\text{HNO}_3$ . *Methyl ester*, stout prisms, m.  $56^\circ$ . 1.5 N alc. KOH gave  *$\delta$ -bromo- $\gamma$ -hydroxy- $\Delta^a$ -dihydromuconic acid*, m.  $195^\circ$ . With  $\text{PCl}_5$  and MeOH *methyl  $\gamma$ -chloro- $\delta$ -bromo- $\Delta^a$ -dihydromuconate* is formed, stout prisms, m.  $41-3^\circ$ . Another reaction product of the alkali is  *$\delta$ -bromo- $\gamma,\xi$ -dihydroxy- $\Delta^{\alpha,\eta}$ -octadiene- $\alpha,\delta,\epsilon,\beta$ -tetracarboxylic acid*, obtained in better yields with more concd. alkali, m.  $239^\circ$ .  *$\gamma,\xi$ -Dihydroxy- $\Delta^{\alpha,\delta,\eta}$ -octatriene- $\alpha,\delta,\epsilon,\beta$ -tetracarboxylic acid* is also formed in the above reaction, and is sepd. by its soly. in AcOEt, m.  $180-1^\circ$ . Muconic ester is another example of a substance which abides by the Thiele rule as far as it concerns the production of a dihydro compd., but departs from it in forming a dibromide. This behavior is strong evidence in support of the views of Erlenmeyer that free valencies and not partial valencies best account for the addition reactions of unsatd. compds. C. J. Wessr

Use of iron pyrites in a Friedel-Crafts reaction. J. A. SMYTH. *J. Chem. Soc.* 121, 1270-9(1922).—This study was undertaken to improve methods of prepn. of S compds. of  $\text{PhCH}_2$ . Use of alc.  $\text{R}_2\text{S}$  has certain disadvantages, which it was thought might be overcome by substituting insol. sulfides. Reaction between finely ground iron pyrites or molybdenite and  $\text{PhCH}_2\text{Cl}$  sets in about  $50^\circ$  with great vigor. HCl is evolved, and a dense non-volatile oil remains. The action is inhibited by  $\text{Et}_2\text{O}$ . The catalyst is probably  $\text{FeCl}_3$ . 24 g.  $\text{PhCH}_2\text{Cl}$  and 45 cc.  $\text{C}_6\text{H}_6$ , heated 12 hrs. with pyrites, gave 4.4 g.  $\text{Ph}_2\text{CH}_2$  and 6 g.  $\text{PhCH}_2\text{Cl}$ . The intensity of the reaction is diminished as the  $\text{PhCH}_2\text{Cl}$  or pyrites is purified. This method is an effective one for removing pyrite from molybdenite, as the latter is not active. When an excess of  $\text{C}_6\text{H}_6$  is used (Friedel-Crafts),  $\text{Ph}_2\text{CH}_2$ , *o*- and *p*-( $\text{PhCH}_2$ ) $_2\text{C}_6\text{H}_4$  have been isolated, and there is evidence of *m*-( $\text{PhCH}_2$ ) $_2\text{C}_6\text{H}_4$  and  $\text{C}_6\text{H}_5(\text{CH}_2\text{Ph})_2$ . Other oils are formed, which may be  $\text{PhCH}_2$  derivs. of  $\text{C}_{10}\text{H}_{18}$ . The possibility of using pyrites is obviously not one capable of even moderate expansion. It might be applicable to some of the somewhat limited no. of cases where a minute quantity of  $\text{FeCl}_3$  is adequate to carry on the catalytic action. Its one merit appears to be that the products are clean and free from tarry matter.

C. J. Wessr

<sup>220</sup> Autoxidation of 2-aceto-1-naphthol in alkaline solution. K. FRIES AND H. LEUB. *Ber.* 55B, 758-63(1922).—NaOH or KOH solns. of 1,2- $\text{C}_{10}\text{H}_7(\text{OH})\text{Ac}$  (A) contg. more



from alc., m. 198°, sol. in concd.  $\text{H}_2\text{SO}_4$  with yellow color soon changing to dirty brown, oxidized back to **E** by  $\text{FeCl}_3$ ; *diacetate*, m. 185°. C. A. R.

**Identification of the dicarboxylic acid resulting by heating 1,5-dihydroxynaphthalene with potassium bicarbonate under pressure.** FRANZ HEMMELMAYR. *Monatsh.* 43, 61-5 (1922); cf. C. A. 12, 275.—The nitration of 1,5-(HO) $_2$ C $_{10}$ H $_4$ (CO $_2$ H) $_2$  leads to the formation of a *dinitro derivative*, slender, yellow prisms, which decomp. without m. *Barium salt*, contg. 5H $_2$ O, small, orange-red crystals, or, contg. 2.5 H $_2$ O, dark Bordeaux-red crystals. Heating with H $_2$ O splits off CO $_2$ . The action of Br gives a compound, C $_{10}$ H $_6$ NO $_2$ Br $_2$  (splitting off of 2 CO $_2$ H and 1 NO $_2$  groups). Ac $_2$ O results in the splitting off of 2CO $_2$ H groups and acetylation of the HO groups, giving the compound C $_{10}$ H $_6$ N $_2$ O $_8$ , m. 205°. The action of Ac $_2$ O on 1,5-(HO) $_2$ C $_{10}$ H $_4$ (CO $_2$ H) $_2$  gives 1,5-*diacetoxy-naphthalene*, m. 158°. The acid is therefore probably 1,5-dihydroxynaphthalene-2,6-dicarboxylic acid. C. J. WEST

**Supposed true dibenzylmethane of Wislicenus; new experiments.** CHARLES DUFRASSE AND PIERRE GERALD. *Compt. rend.* 173, 985-7 (1921).—D. (C. A. 15, 1020) showed that PhCH:CHBr (thought by Wislicenus to be PhCBr:CHBr) gives with alc. NaOH not CH $_2$ Bz $_2$  (A) but its enolic Et ether (B), BzCH:C(OEt)Ph. NaOEt in alc. gives better yields of B, the structure of which was proved by prep. it from BzCH:CHPh with Br $_2$  and alc., the intermediate compd.  $\alpha$ -bromo- $\beta$ -ethoxybenzylacetophenone, BzCHBrCH(OEt)Ph, colorless needles, m. 60-1°, b $_{1-4}$  182-3°, being isolated. Alkali readily removes HBr, giving B. BEN H. NICOLET

**Anthracene series. II.** E. DE B. BARNETT AND J. W. COOK. *J. Chem. Soc.* 121, 1376-91 (1922); cf. C. A. 16, 2514.—C $_{14}$ H $_{10}$  in C $_6$ H $_5$ N, treated with Br, gives a pyridinium salt. Those hydroxyanthraquinones which do not contain 2 HO groups in the *o*- or *p*-position with reference to one another do not give salts but are merely brominated. Thus no salt was obtained with 1-HOC $_{14}$ H $_9$ O $_2$ , 2-HOC $_{14}$ H $_9$ O $_2$ , 1,3-(HO) $_2$ C $_{14}$ H $_6$ O $_4$  or 1,5-(HO) $_2$ C $_{14}$ H $_6$ O $_4$ , but the Br deriv. seps. in the form of a C $_6$ H $_5$ N salt, which loses the C $_6$ H $_5$ N on treatment with AcOH. *Quinizarin-2,3-dipyridinium dibromide*, by the action of 2 mols. Br upon the C $_6$ H $_5$ N soln., brown needles, with 2 AcOH, m. 285° (decompn.). Heated with C $_6$ H $_5$ N it gives the *phenobetaine*, C $_{20}$ H $_{10}$ O $_4$ N $_2$ Br. H $_2$ O, deep blue microneedles. 1 mol. Br did not react with quinizarin. *Bromoalizarinpyridinium bromide*, by the action of Br in C $_6$ H $_5$ N and crystn. from HBr, glistening pale brown needles, with 1.5 H $_2$ O, did not m. 300°, though the H $_2$ O is lost very slowly at 130°. The same product is formed from 3-bromoalizarin or alizarinquinone dibromide. The *phenobetaine*, C $_{10}$ H $_{10}$ O $_4$ NBr, forms a deep purple powder, sol. in hot dil. acids with a yellow color; *sulfate*, golden yellow plates. 3 mols. Br gives *alzarindipyridinium dibromide*, pale yellowish brown powder. *Monoperbromide*, yellow powder. *Mono-phenobetaine*, C $_{20}$ H $_{11}$ O $_4$ N $_2$ Br.H $_2$ O, deep blackish red hygroscopic needles, decomp. about 306°. HBr reconverts it to the dibromide. *Monoacetate*, by recrystg. the dibromide from glacial AcOH, yellow needles, m. 309° (decompn.). The salt of *hysiazarin* was not obtained pure owing to partial conversion into the *phenobetaine*, deep purple powder. *Alizarin-4-pyridinium-3-nitrolbetaine*, deep red needles. The 4-nitrol derivative forms a red powder, sol. in dil. acids with yellow color. 3-Bromoalizarin on nitration gives the 3-NO $_2$  deriv., and this is reconverted into the 3-Br deriv. when treated with Br. C. J. WEST

**Catalytic double action of copper.** EDUARD KOPITSCHNI AND HERTA WIESLER. *Monatsh.* 43, 89-92 (1922).—The action of Cu(OAc) $_2$  or Cu powder on 1,2-Cl(H $_2$ N)-C $_{14}$ H $_6$ O $_2$  in PhNMe $_2$  leads to the formation of  $\beta$ -H $_2$ NC $_{14}$ H $_6$ O $_2$ . In the presence of K $_2$ CO $_3$ , however, the reaction products are flavanthrene and indanthrene; these can be sepd. by extg. with Na $_2$ S, in which flavanthrene is sol. C. J. WEST

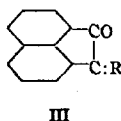
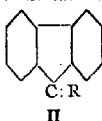
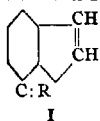
**New method of forming thiazole derivatives of the anthraquinone series.** EDUARD



KOPITSCHNI AND HERTA WIESLER. *Monatsh.* **43**, 81-7(1922).—Evapn. to dryness of 1-mercapto-2-aminoanthraquinone with alc. aq.  $\text{NH}_4\text{OH}$  several times gives *2-aminoanthraquinone-1-thiazole*,  $\text{C}_{14}\text{H}_9\text{ON}_2\text{S}$ , microneedles, m.  $285^\circ$  (decompn.). The EtOH and AcMe solns. have a green fluorescence; the soln. in concd.  $\text{H}_2\text{SO}_4$  is brick-red. *Acetate*, long, olive-yellow needles, m.  $294^\circ$ . The same product is obtained from 2,2'-diaminodianthraquinone 1,1'-disulfide. 3,3'-Dichloro-2,2'-diaminodianthraquinone 1,1'-disulfide and  $\text{NH}_4\text{OH}$  in a sealed tube give the compound  $\text{C}_{14}\text{H}_7\text{ON}_2\text{Cl}_2\text{S}$ , large, olive-green prisms with bluish metallic reflex, m.  $322-4^\circ$ . Dianthraquinone 1,1'-disulfide and  $\text{NH}_4\text{OH}$  give anthraquinone-1-thiazole.

C. J. WEST

**Synthesis of new glucosides.** REMO DE FAZI. *Gazz. chim. ital.* **52**, I, 429-31 (1922).—Glucosides derived from indene, fluorene, and acenaphthene have not previously been found in nature nor synthesized. de F. has obtained a glucoside derived from each of these hydrocarbons. 2.5 g. Na in 100 cc. abs. EtOH were treated with 4 g. helicin and heated to dissolve it. 2 g. indene in 25 cc. abs. EtOH were added and after 15 days at room temp. the ppt. of the *2-hydroxybenzylidenindene glucoside* ( $\text{R} = \alpha\text{-(C}_6\text{H}_5\text{O)}\text{OC}_6\text{H}_4\text{CH} =$ ) (I) was filtered off; pale yellow crystals from EtOH, m.  $205-6^\circ$ , gives a green color in concd.  $\text{H}_2\text{SO}_4$  which becomes emerald-green on dissolving. If 2.5 g. fluorene is added instead *2-hydroxybenzylidenefluorene glucoside* (II) is obtained as small yellow needles, m.  $198-200^\circ$ ; the EtOH soln. gives a red-violet color with concd.  $\text{H}_2\text{SO}_4$  at the contact surface. 50 cc. abs. EtOH + 1.7 g. helicin + 1 g. acenaphthenone (Graebe, *Ann.* **327**, 77(1903)) were treated with 5 g. NaOH in 5 cc.  $\text{H}_2\text{O}$ . After 24 hrs.  $\text{H}_2\text{O}$  was added and the *2-hydroxybenzylideneacenaphthene glucoside* (III) was pptd.; small bright yellow needles from EtOH, m.  $246-8^\circ$  and dissolve in concd.  $\text{H}_2\text{SO}_4$  with an intense orange color and a green fluorescence. de F. thinks that these compds. belong to the  $\alpha$ -series of Fischer's classification.



E. J. WITZEMANN

**Picrotoxin. XII. Picrotin ketone,  $\text{C}_{14}\text{H}_{16}\text{O}_4$ .** P. HORRMANN AND F. BISCHOF. *Arch. Pharm.* **259**, 165-76(1921).—The ketone,  $\text{C}_{14}\text{H}_{16}\text{O}_4$ , was first noticed among the reduction products of picrotoxin into  $\alpha$ -picrotinic acid and picrotoxinic acid by boiling with mineral acids, and then reducing in the same way as picrotoxin itself. It was isolated by means of its oxime, m.  $212^\circ$ , and purified by distn. in a vacuum, b.  $190^\circ$ . It forms a thick colorless syrupy crystg. on long standing. Its semicarbazone m.  $216^\circ$ . By the action of MeOH and KOH it is hydrolyzed into AcOH and the substance  $\text{C}_{12}\text{H}_{14}\text{O}_2$ . An attempted degradation of the ketone by conversion into an unsatd. compd. through the corresponding tertiary alc. obtained by the action of  $\text{MgMeI}_2$  was not successful. *Oximinopicrotin ketone*,  $\text{C}_{11}\text{H}_{14}\text{O}_4 \cdot \text{C}(\text{NOH})\text{COMe}$  is obtained by the action of  $\text{AmNO}_2$  and EtONa on the ketone, m.  $215^\circ$ , and yields a semicarbazone m.  $249^\circ$  (decompn.), a *phenylhydrazone* m.  $220^\circ$ , an *oxime* m.  $192^\circ$  and a Bz deriv. m.  $178-82^\circ$ . It did not yield the diketone on treatment with  $\text{NaNO}_2$  or mineral acids, but oxidation with  $\text{HNO}_3$  or  $\text{NH}_3\text{-Ag}_2\text{O}$  converts it into AcOH and a *monobasic acid*,  $\text{C}_{11}\text{H}_{11}\text{O}_4 \cdot \text{CO}_2\text{H}$ , which could not be obtained in a cryst. form. By the action of  $\text{NaBrO}_3$  the ketone is converted into  $\alpha$ -bromopicrotin ketone,  $\text{C}_{14}\text{H}_{15}\text{O}_4\text{Br}$ , coarse needles, m.  $145^\circ$ .

W. O. F.

**Octobromoindigo.** EUG. GRANDMOUGIN. *Compt. rend.* **173**, 982-5(1921).—As predicted, octobromoindigo (A) has a distinctly redder shade than the di-, tetra-, and hexabromoindigos (wave lengths of max. light absorption are given for these) and

is not technically valuable. A substance of the formula of **A** described in D. R. P. 224,809, 230,596 and 236,902, is evidently not **A**, as it loses 2 Br too easily. *o*-Br<sub>2</sub>C<sub>6</sub>(CO<sub>2</sub>H)<sub>2</sub> readily gave HO<sub>2</sub>CC<sub>6</sub>Br<sub>2</sub>NH<sub>2</sub>, which with H<sub>2</sub>CO, HCN, and subsequent hydrolysis, readily yielded HO<sub>2</sub>CC<sub>6</sub>Br<sub>2</sub>NHCH<sub>2</sub>CO<sub>2</sub>H (**B**). **B**, with Ac<sub>2</sub>O, formed acetyl-tetrabromoindoxylic acid, which, warmed with NH<sub>4</sub>OH in a current of air, yielded **A**, somewhat sol. in hot PhNO<sub>2</sub>, and PhCO<sub>2</sub>Et, insol. in common solvents.

BEN H. NICOLET

**The 6-alkoxyquinolindines.** G. O. GUTHEKUNST AND H. LEBB. GRAY. *J. Am. Chem. Soc.* 44, 1741-6(1922).—*p*-Nitrophenyl butyl ether (108 g. from 130 g. *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH (**A**) and 56 g. KOH in 2 l. of 50% alc. refluxed 12 hrs. with 2 l. BuOH and 184 g. BuI), needles from alc., m. 32°, gives on boiling a short time with SnCl<sub>2</sub> and concd. HCl 95.7% of the amino compound, light yellow oil, b<sub>12</sub> 143-4°. *p*-Nitrophenyl isoamyl ether (94.5 g. from 139 g. **A** and 155 g. iso-AmBr), pale yellow oil, b<sub>12</sub> 183°; amino compound (yield, 94.52%), pale yellow oil, b<sub>12</sub> 149-50°. *p*-Acetaminophenyl allyl ether (84 g. from 151 g. *p*-AcNHCH<sub>2</sub>CH<sub>2</sub>OH (**B**) and 56 g. KOH in 2 l. of 75% alc. refluxed 8 hrs. with 121 g. C<sub>2</sub>H<sub>5</sub>Br), crystals from C<sub>6</sub>H<sub>6</sub>, m. 88-9°; *p*-aminophenyl allyl ether, light yellow oil, b<sub>12</sub> 143-4°, obtained in 90 g. yield from 194 g. of the sulfate, plates, m. 244° (decompn.), which in turn is obtained in 92% yield from the above Ac deriv. *p*-Acetaminophenyl butyl ether (136 g. from 200 g. **B** and 72 g. KOH in 2 l. 50% alc. refluxed 6 hrs. with 260 g. BuI in 2 l. BuOH), needles from C<sub>2</sub>H<sub>5</sub>, m. 112°; free amino compound, light yellow oil, b<sub>12</sub> 143-4° (yield, 81.03%), obtained from the sulfate, plates, m. 270° (decompn.), obtained in 97.5% yield by hydrolyzing the Ac deriv. with 20% H<sub>2</sub>SO<sub>4</sub>. *p*-Acetaminophenyl benzyl ether (115 g. from 151 g. **B**, 56 g. KOH, 2 l. of 50% alc. and 186 g. PhCH<sub>2</sub>Cl refluxed 6 hrs.), needles, m. 142°. *p*-Acetaminophenyl isobutyl ether, needles, m. 80-1°; yield, 33.8%; amino compound, b<sub>10</sub> 145-6° (yield, 82%), prepd. through the sulfate, plates, decomp. 251-2° (yield, 87%). *p*-Acetaminophenyl isoamyl ether (147 g. from 151 g. **B** and 165 g. iso-AmBr), plates from C<sub>6</sub>H<sub>6</sub>, m. 103-3.5°; amino compound, light yellow oil, b<sub>12</sub> 149-50°; sulfate, plates, m. 253-4° (decompn.) (yield, 97%). 6-Propyloxyquinolindine, prepd. by the Doebner-Miller method, light yellow, b<sub>16</sub> 176-7°; ethiodide, pale yellow needles from Et<sub>2</sub>O-EtOH, m. 147.5°. 6-Allyl analog, red oil obtained in only very small amt.; ethiodide, yellow needles from Et<sub>2</sub>O-EtOH. 6-Butyl compound, orange crystals, b<sub>12</sub> 182-3°, yellow nodules from petroleum ether, softens 48°, m. 52°; ethiodide, yellow needles from Et<sub>2</sub>O-EtOH, m. 186°. 6-Isobutyl isomer, b<sub>12</sub> 171-2°; ethiodide, yellow needles from EtOH-Et<sub>2</sub>O, m. 42°. 6-Isoamyl homolog, light yellow, b<sub>16</sub> 182-3°; ethiodide, yellow needles from Et<sub>2</sub>O-EtOH, m. 201°.

C. A. R.

**Spirans. IX. Preparation of bishydrocarbostyryl-3,3-spiran and its by-products.** HERMANN LEUCHS AND HANS V. KATINSZKY. *Ber.* 55B, 710-23(1922); cf. C. A. 9, 3242.—When attempts were made to prep. bishydrocarbostyryl-3,3-spiran (**A**), CO.NH.C<sub>6</sub>H<sub>4</sub>.CH<sub>2</sub>.C.CH<sub>2</sub>.C<sub>6</sub>H<sub>4</sub>.NH.CO, by following Radulescu's method as closely

as is possible from his description (C. A. 5, 2826) (reduction of (o-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>)<sub>2</sub>C-(CO<sub>2</sub>Et)<sub>2</sub> with Zn and HCl in boiling alc.), there was obtained only 45% of a crude product giving a violet color with FeCl<sub>3</sub>, sol. in 80-90 parts boiling AcOH and several % low in C, this deficit in C being greater when the alk. soln. was pptd. with HCl instead of H<sub>2</sub>O; the low C content is not due to any difficulty in completely burning the compd., as believed by R., but to the presence of substances richer in O and of Cl derivs. By boiling out the crude product with AcOH preps. of const. soly. (but varying in different preps., e. g., 1:140 and 1:158) and with 72-2.8% C (calcd. 73.38) were finally obtained; they no longer gave a color with FeCl<sub>3</sub> but still contained some Cl (0.7-1.4%). Besides these by-products probably many others are formed; of these 3 have been isolated.

They are obtained in large amt. from the alc. mother liquors of the crude **A** by pptg. with  $H_2O$  and extg. the ppt. with  $NH_4OH$ ;  $HCl$  ppts. a cryst. powder from which can be obtained by means of  $AcOH$  *p,p'*-dihydroxybiskydrocarbestyryl-3,3-spiran (**B**); it is accompanied by the *p*-monohydroxy compound, (**C**), sepd. as the difficultly sol. acetate from the more easily sol. diacetate of **B** and obtained pure from the acetate by hydrolysis with  $NH_4OH$ . The formation of **B** and **C** is probably to be explained by the fact that the reduction of the  $(O_2NC_6H_4CH_2)_2C(CO_2Et)_2$  takes place through the mono- and dihydroxylamine compds., which are rearranged by the acid into the *p*-aminophenol derivs.; these then, by closure of the ring, form the spirans. The chlorinated derivs. are probably formed in the same way, the  $HCl$  converting the  $NHOH$  groups partly into  $NHCl$  and the  $Cl$  migrating to the nucleus. There is also formed a basic compound  $C_{19}H_{15}O_2N_2$  (**D**), pptd. from the  $HCl$  soln. by  $NH_4OH$  and m.  $194^\circ$ , probably identical with the substance thought by R. to be  $(p-H_2NC_6H_4CH_2)_2C(CO_2Et)_2$ , a precursor of **A**. Pure **A** can be obtained in 2 ways: in 80% yield by treating  $(O_2NC_6H_4CH_2)_2C(CO_2Et)_2$  in alc.  $HCl$  suspension at  $0^\circ$  with  $Zn$  dust and then heating the clear soln. with  $H_2O$ , and in 90% yield by reducing in the same way ethyl  $\beta$ -o-nitrobenzylhydrocarbestyryl- $\beta$ -carboxylate (**E**),  $CO.NH.C_6H_4.CH_2.C(CH_2C_6H_4NO_2)CO_2Et$ . In the reduction of the

di- $NO_2$  ester there were still obtained 16–21% of **D**, which forms well crystd. salts with 1 mol. of acids, contains one  $OEt$  group (Zeisel) and on long boiling with  $HI$  or  $HBr$  yields a base (**F**),  $C_{19}H_{15}N_2$ , identical with Reissert's  $\Delta$ -*N*-tetrahydronaphtholine, obtained by reduction of  $(o-O_2NC_6H_4CH_2)_2CHCO_2H$  (*Ber.* 27, 2244(1894)); **A** likewise yields **F** on long boiling with  $HBr-AcOH$ , the amide group or groups resulting from its hydrolysis at once losing  $CO_2$ , so that the formation of **F** from **D** is no proof that **D** is a  $\Delta$ -*N*-tetrahydronaphtholine- $\beta$ -carboxylate,  $C_6H_4 \begin{matrix} CH_2C(CO_2Et).CH_2 \\ \diagup \quad \diagdown \\ N = C - NH - C_6H_4 \end{matrix}$ ; that it is really an ether,  $EtOC.N.C_6H_4.CH_2.C.CH_2.C_6H_4.CO.NH$ , of a lactim isomeric

with **A** is shown by 2 further facts: Whereas **F** gives an  $Ac$  deriv. with  $Ac_2O$ , **E** remains unchanged even on boiling; and, secondly, **D** can be obtained by converting **A** into the imide chloride which with cold  $NaOEt$  gives about 33% of **D**. The clear soln. obtained by reducing  $(O_2NC_6H_4CH_2)_2C(CO_2Et)_2$  at  $0^\circ$  contains the  $HCl$  salt of the di- $NH_2$  ester; the free ester is pptd. by  $NaOAc$  in amorphous flocks sol. in  $CHCl_3$  but all attempts to cryst. it resulted in the formation of **A**; that it is the di- $NH_2$  ester, however, can be shown by diazotizing and boiling the resulting bisdiaz compd. with  $H_2O$ , which gives **N** and bisdihydrocoumarin-3,3-spiran (**G**), although in rather poor yield, the boiling with  $H_2O$  apparently also resulting in other reactions, probably brought about by the  $CH_2$  or ester groups. **B**, needles from  $AcOH$ , m.  $265-8^\circ$  (decompn.), easily sol. in  $NH_4OH$ , alkalis and soda, gives a strong violet color with  $FeCl_3$ ; diacetate, stout 4-sided crystals from alc., m.  $177-9^\circ$ , gives no color with  $FeCl_3$  in alc., insol. in  $NH_4OH$ . **C**, slender prisms or needles from  $AcOH$ , decompn.  $255-85^\circ$ , gives a violet color with  $FeCl_3$  in alc., easily sol. in alkalis, somewhat less in  $NH_4OH$ ; acetate, needles from  $AcOH$ , m.  $246-8^\circ$  (decompn.), insol. in  $NH_4OH$ , gives no color with  $FeCl_3$  is hydrolyzed to **C** by standing overnight in  $NH_3$  in  $MeOH$ . **A**, broad needles sol. in 150 parts boiling  $AcOH$  and in 35–40 mols. of  $N$  alc.  $KOH$  at  $20^\circ$ , becomes brown  $320^\circ$ , m.  $350-60^\circ$ , sublimes about  $300^\circ$  under 15 mm. in short prisms. **D**, long felted needles from alc., sinters  $188^\circ$ , m.  $192-4^\circ$ , very slightly sol. in boiling  $H_2O$  and in alkalis, dissolves in  $HCl$  but soon seps. as the hydrochloride, needles extd. from  $H_2O$  by  $CHCl_3$  and giving with  $ZnCl_2$  in  $H_2O$  short thick prisms or polyhedrons likewise easily sol. in  $CHCl_3$ ; nitrate, hydrobromide, sulfate, acetate, difficultly sol. needles. **F**, needles, m.  $217-8^\circ$  (Reissert gives  $211-2^\circ$ ). When 3.4 g.  $Na$  in 50 cc. alc. is treated with 48 g.  $CH_3(CO_2Et)_2$  and 17.2 g.

$o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ , boiled 15 min. the following day, faintly acidified, freed from the excess of  $\text{CH}_3(\text{CO}_2\text{Et})_2$  with steam, extd. with  $\text{CHCl}_3$ , evapd. and crystd. from 60 cc. alc. at  $-10^\circ$ , 4.9 g.  $(\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2)_2\text{C}(\text{CO}_2\text{Et})_2$  seps.; the mono-deriv. remaining in soln. is dild. to 250 cc., half-satd. with dry  $\text{HCl}$ , treated with 25–30 g. Zn dust, concd. *in vacuo* to 100 cc., poured upon ice and pptd. with  $\text{NH}_4\text{OH}$ , giving 13 g. Et hydrocarbostyryl- $\beta$ -carboxylate (H), needles from  $\text{C}_6\text{H}_6$ -ligroin, m.  $137\text{--}8^\circ$ . Dimethyl di-[*o*-nitrobenzyl]malonate (4.5 g. from 0.15 atom Na in MeOH and 0.3 mol.  $\text{CH}_3(\text{CO}_2\text{Me})_2$  with 0.1 mol.  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ ), tablets or stout prisms from MeOH, m.  $137\text{--}8^\circ$ . The mono-deriv. in this case also is non-crystallizable; reduced like the Et ester it gives methyl hydrocarbostyryl- $\beta$ -carboxylate, felted needles from  $\text{C}_6\text{H}_6$ , m.  $163\text{--}5^\circ$ . E (2.7 g. from 2.19 g. H in 30 cc. alc. contg. 0.23 g. Na allowed to stand 2 hrs. with 1.72 g.  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$  and then boiled 30 min.), faintly yellowish stout prisms or columns from alc., m.  $143.5\text{--}4.5^\circ$ . D (obtained in only about 10% yield), massive tablets from alc., m.  $237^\circ$ , has a pleasant commarin odor, sol. in KOH only on heating, insol. in  $\text{NH}_4\text{OH}$ . Hydrocarbostyryldihydrocoumarin-3,3-spiran (obtained in 35% yield from E reduced in the cold, diazotized and boiled), fine needles from alc., m. about  $280^\circ$ , has no odor.

C. A. R.

**Strychnos alkaloids. XXXI.** The violet and the green color reaction of cacotheline. HERMANN LEUCHTS AND HANS KÄHRN. *Ber.* 55B, 724–32(1922); cf. C. A. 16, 2692.—Before it had been established that cacotheline (A),  $\text{C}_{21}\text{H}_{21}\text{O}_7\text{N}_3 \cdot \text{HNO}_3$ , is a quinone, the color reaction which it undergoes with  $\text{SnCl}_4$  or  $\text{SO}_2$  had been supposed to be an isomerization of the green A into a violet salt; it has now been found that in the reaction there are really taken up 2 atoms of H:  $\text{C}_{21}\text{H}_{21}\text{O}_7\text{N}_3 \cdot \text{X} + \text{H}_2 = \text{C}_{21}\text{H}_{23}\text{O}_7\text{N}_3 \cdot \text{X}$  (X = 1 mol. acid). The old analyses of the violet chloride and nitrate and not entirely homogeneously colored sulfate agree better with the formula with 23 than with that with 21 H atoms, and the new formula has also been confirmed by analyses of samples of violet salts prepd. in a different way, among them the HBr and the  $\text{Me}_2\text{SO}_4$  compds. These were prepd. by pptg. the free base  $\text{C}_{21}\text{H}_{23}\text{O}_7\text{N}_3$  (B) from the red-violet chloride (protected from the air) with 1 mol. alkali. B seps. in dark violet crystals so that the color is not dependent on the presence of an acid. From the free B any desired salt can be prepd. by treating with the corresponding acid, providing the air is excluded. These violet salts are reconverted into the yellow salts corresponding to A by oxidizing agents ( $\text{HNO}_3$ ,  $\text{Fe}^{+++}$  salts) and even on standing in  $\text{H}_2\text{O}$  in the air, but if the air is excluded  $\text{H}_2\text{O}$  and even  $\text{NH}_4\text{OH}$  solns. are stable for a long time. The violet salts must therefore be the quinols corresponding to the quinone A, but the extraordinary deepening in color makes it probable that while the original quinone grouping does indeed disappear in the reduction it is replaced by another quinonoid grouping. The violet B or “nitroquinol” with MeOH or EtOH and HCl in the presence of  $\text{Me}_2\text{CO}$  gives violet mono-ester salts,  $\text{C}_{22}\text{H}_{25}\text{O}_7\text{N}_3 \cdot \text{HCl}$  (D) and  $\text{C}_{23}\text{H}_{27}\text{O}_7\text{N}_3 \cdot \text{HCl}$  (E), and on stronger esterification in the absence of  $\text{Me}_2\text{CO}$  violet di-ester salts,  $\text{C}_{23}\text{H}_{27}\text{O}_7\text{N}_3 \cdot \text{HCl}$  (F) and  $\text{C}_{24}\text{H}_{29}\text{O}_7\text{N}_3 \cdot \text{HCl}$  (G). The formula of B,  $\text{C}_{21}\text{H}_{23}[\text{C}(\text{OH}) \dots \text{C}(\text{OH})] \equiv \text{C}(\text{NO}_2); \equiv \text{N}, =\text{NH}, -\text{CO}_2\text{H}, =\text{CH}(\text{OH})$ , contains but one esterifiable group,  $\text{CO}_2\text{H}$ ; a 2nd can be produced only if the  $\equiv \text{C}(\text{NO}_2)$  group changes into  $=\text{C}(\text{N}(:\text{O})\text{OH})$ , but this simultaneously produces a new quinonoid arrangement, for the H can come only from HO groups on the same aromatic nucleus as the  $\text{NO}_2$  group, or from the  $=\text{NH}$  residue, also probably on the same nucleus. The formation of such a quinone would satisfactorily explain the deepening in color which results when B is prepd. B heated with  $\text{Ac}_2\text{O}$  in the absence of air yields a red-yellow soln. from which  $\text{KHCO}_3$  ppts. a yellow diacetyl derivative (H),  $\text{C}_{21}\text{H}_{21}[\text{C}(\text{OAc}) \dots \text{C}(\text{OAc})] \equiv \text{C}(\text{NO}_2), -\text{CO}_2\text{N} \equiv \text{N}, =\text{CH}(\text{OH})$ ; i. e., when the H atoms of the HO and NH groups are fixed (that of the NH group disappears by inner amide formation) the color changes from dark violet

to yellow. The violet color does not reappear when one of the HO groups is set free; **H** boiled with aq. alc. gives a light red *monoacetyl derivative* (**I**) forming yellow salts. Nor does the setting free of the 2nd phenolic HO group produce the violet color; it was found (C. A. 14, 2185) that the methochloride of **B** boiled with  $\text{Ac}_2\text{O}$  and treated with  $\text{NaHCO}_3$  gives a red-yellow Ac-free anhydride which must contain the groups  $-\text{CO.N}=\equiv\text{C.O.NMe}\equiv$  (phenolbetaine) and  $\equiv\text{C(OH)}$ ; with acids, 1 mol. adds to the betaine, forming  $\equiv\text{C(OH)Cl.NMe}\equiv$ , so that both phenol HO groups in the mol. are set free, and yet the color remains yellow to red-yellow. It must therefore be the  $\equiv\text{NH}$  group in **B** which gives up its H to the  $\text{NO}_2$  group with production of the violet color. **B** (0.4 from 0.5 g. of the violet HCl salt dissolved in  $\text{H}_2\text{O}$  at  $100^\circ$  in a current of H and treated with 1 cc. N alkali), violet prisms losing 6.47%  $\text{H}_2\text{O}$  at  $80^\circ$  under 15 mm., sol. in  $\text{NH}_4\text{OH}$  and in 2-2.5 mols. alkali under H with red-violet, in more alkali with dark blue color; acidification after not too long a time produces a violet soln. *Sulfate* of **B**, violet 4-sided tables with 10.3%  $\text{H}_2\text{O}$  from 2.5 N  $\text{H}_2\text{SO}_4$ ; *hydrobromide*, blue-violet 4- to 6-sided prisms with 1.34%  $\text{H}_2\text{O}$  from dil. HBr under H, at once gives with FeBr, the yellow *hydrobromide* corresponding to A, 3-, 4- and 6-sided tables and prisms with 1.63%  $\text{H}_2\text{O}$ , sol. in about 100 parts  $\text{H}_2\text{O}$  at  $100^\circ$ . *Dimethyl sulfate compound* of **B**, from **B** in MeOH heated with  $\text{Me}_2\text{SO}_4$  under H, dark-violet trapeze-shaped crystals; its solns. become yellow in the air. **D** (0.6 g. from 1 g. **B.HCl** in 40 cc. MeOH and 20 cc.  $\text{Me}_2\text{CO}$  with 5 g. HCl gas and a little  $\text{SO}_2$  boiled until completely dissolved (20-30 min.)), red-violet prisms with 6%  $\text{H}_2\text{O}$ , forms in alkali a soln. very quickly passing through blue-violet and green to yellow. **F** (0.9 g. from 1 g. **B.HCl** in 40 cc. MeOH treated with HCl gas and a little  $\text{SO}_2$  until dissolved and concd. over  $\text{H}_2\text{SO}_4\text{-KOH}$  to 10 cc.), lemon-yellow tables of the compn.  $\text{F.2HCl.3MeOH}$ , losing  $2\text{HCl} + 3\text{MeOH}$  at  $100^\circ$  under 15 mm., becomes dark violet on drying at  $100^\circ$ , also very quickly in the air, the air-dried salt losing only 9.6% at  $100^\circ$ , seps. from hot MeOH in violet prisms,  $\text{F.3H}_2\text{O}$ ; the violet salt is easily sol. in  $\text{H}_2\text{O}$  and warm MeOH, seps. from cold  $\text{H}_2\text{O}$  in fine needles, forms in alkalies and  $\text{NH}_4\text{OH}$  violet solns. stable for a long time in the air but finally becoming yellow. **E** (2.2 g. from 3 g. **B.HCl**), red-violet 4-sided leaflets with  $2\text{H}_2\text{O}$  from alc., becomes yellow almost immediately in alkalies. **G**, fine brick-red needles with 1.6%  $\text{H}_2\text{O}$ , very easily sol. in  $\text{H}_2\text{O}$  with violet color, pptd. by HCl in violet amorphous condition, seps. from hot alc. in red needles, from cold alc. in violet broad domatic prisms, forms in alkalies violet solns. stable in the air much longer than those of **E**; the violet  $\text{NH}_4\text{OH}$  soln. becomes green and yellow rapidly. **H** (0.8-1.0 g. from 2 g. **B.HCl** heated 3 hrs. at  $100^\circ$  in H with 30 cc.  $\text{Ac}_2\text{O}$ , filtered, heated 15 min. longer, evapd. *in vacuo*, taken up in 20 cc.  $\text{H}_2\text{O}$  and pptd. with 3 g.  $\text{KHCO}_3$ ), dark yellow, partly amorphous, partly consisting of prisms, contains 1.2-1.44%  $\text{H}_2\text{O}$ , turned violet by  $\text{NH}_4\text{OH}$ , alkalies or HBr, easily sol. in acids, converted (50%) by boiling in EtOH- $\text{H}_2\text{O}$  (3:1) into **I**, red tetra- and octahedrons with 5%  $\text{H}_2\text{O}$ , sol. in very dil. acids with yellow color, becomes discolored  $230^\circ$ , turned violet by alkalies or HBr; the *sulfate* and *hydrochloride* form difficultly sol. prisms, the *hydrobromide* leaflets. C. A. R.

Rare organic chemicals. H. T. CLARKE. *J. Ind. Eng. Chem.* 14, 836-7(1922).

E. J. C.

Organic catalysis. E. E. REID. *J. Ind. Eng. Chem.* 14, 838-9(1922).—A review

E. J. C.

Thermochemistry of organic substances (SWIENTOSLAWSKI) 2. Hyposulfites and formaldehyde sulfoxylates (Japn. pat. 39,633) 18.

FISCHER, EMIL: Untersuchungen über Kohlenhydrate und Fermente II: 1908-19. Edited by M. Bergmann. Berlin: J. Springer. M 186, bound M 219.

HENRICH, FERDINAND: *Theories of Organic Chemistry*. Translated from revised 4th German edition by T. B. Johnson and D. A. Hahn. New York: John Wiley & Sons, Inc. 620 pp. \$6.

**Ethylene derivatives.** FARBENFABRIKEN VORM. F. BAYER & CO. Brit. 177,362, Feb. 23, 1921. A gaseous mixt. contg.  $C_2H_4$  and a halogen or an acid chloride is treated with porous charcoal, prepd. according to 10,126 (C. A. 9, 2801) 1914, as a catalyst either with or without a halogen carrier such as chlorides of Sb, S, P, etc. E. g., the  $C_2H_4$  of coal gas is caused to react with Cl with and without  $SbCl_3$ , with Br, and with  $COCl_2$ , forming, resp.,  $C_2H_4Cl_2$ ,  $C_2H_4Br_2$  and  $CH_2ClCH_2CO_2H$ .

**Reaction of acetylene and hydrogen sulfide or other compounds.** B. C. STURR and W. GRUB. U. S. 1,421,743, July 4.  $C_2H_2$  and  $H_2S$  are passed at a temp. of  $320^\circ$  over bauxite, and the gases produced are cooled, producing a condensate which contains 35% S and on redistn. yields a clear liquid distg. almost completely below  $120^\circ$ . It is a practically pure *thiophene*.  $C_2H_2$  and  $H_2S$  at  $300^\circ$  with a catalyst of  $Ni(OH)_2$  and cement yields a mixt. of reaction products from which *mercaptan*, *thiophene* and *methylthiophene* may be fractionated.  $C_2H_2$  and  $NH_3$  at  $350$ – $380^\circ$  with bauxite form *acetonitrile* and other *nitriles* and N-contg. bases, including *picoline*, and the *pyrroles*.  $C_2H_2$  and steam at  $350^\circ$  with bog Fe ore yields a mixt. of higher *aldehydes*, *acetone*, *alc.*, *HOAc*, *furfuran derivs.*, *phenols*, creosote-like products and resinous and tarry substances from which a good resin solvent may be obtained by fractional distn.  $C_2H_2$  and steam at  $400$ – $420^\circ$  with bog Fe ore yield principally *acetaldehyde*. O or oxidizing agents may also be used in the reacting mixts. to produce mixed oxidation products. Fe and Al hydroxides may serve as catalysts, and fullers earth or zeolites may be used as carriers. Metals such as Cu, Ni, Co, Mn, Cr, Ce or V also may be used.

**Chlorinating gaseous hydrocarbons.** G. O. CURME, JR. U. S. 1,422,833, July 18. An excess of gaseous hydrocarbon, e. g., natural gas, is mixed with Cl and after reaction with production of HCl the reaction products of higher b. p. than the hydrocarbon are sepd. by anhydrous liquefaction and the remaining gas is returned for further treatment in the chlorinating app.

**Purifying higher secondary alcohols.** R. B. LERO. U. S. 1,422,583, July 11. Secondary alcs. higher than isopropyl alc., e. g., secondary butyl alc., mixed with isopropyl alc. are treated with  $C_6H_6$  to form a low b. p. mixt. with the isopropyl alc. and the mixed products are subjected to fractional distn.

**Esterifying alcohols.** J. A. STREYGENS. U. S. 1,421,604, July 4. An alc. and acid, e. g., EtOH and lactic acid, are esterified in the presence of a third liquid such as  $C_6H_6$  miscible with the alc. but substantially immiscible with  $H_2O$ , the vapors produced from this mixt. are rectified and a condensate is obtained which seps. into 2 layers high and low in  $C_6H_6$ . The layer low in  $C_6H_6$  is scrubbed to recover  $C_6H_6$  and the ester formed and constituents of the condensate layer high in  $C_6H_6$  are recovered by fractional distn. Esters of tartaric oxalic, citric, chloroacetic, maleic, malic and succinic or other acids with EtOH, propyl alc., glycol or glycerol may be similarly formed. Toluene,  $CCl_4$  or  $C_6H_6$  may be used instead of  $C_6H_6$ . U. S. 1,421,805 relates to production of ethyl isovalerate or similar esters from the alc. and acid in a similar manner except that a catalyst is also employed, e. g., HCl,  $H_3PO_4$ ,  $ZnCl_2$  or  $H_2SO_4$ ; this process is adapted to the production of Et butyrate, valerate, propionate, benzoate, salicylate or acid sulfate. The esters formed may be purified by distn. *in vacuo* or with steam.

**Distilling formaldehyde solutions.** F. POLLAK. U. S. 1,422,475, July 11.  $CH_2O$  solus. contg. MeOH are distd. by allowing the soln. to fall in drops upon a surface heated above the b. p. of the least volatile constituent of the soln. so that spherical drops form which vaporize with explosion-like rapidity and form vapors from which the  $CH_2O$

may be condensed (preferably after passage of the vapors over a hot Cu spiral to oxidize the MeOH present). It is also proposed to effect distn. of various mixts., including alloys, drop by drop, in a similar manner.

**Dialkyl sulfates.** H. DREYFUS. Brit. 177,189, Sept. 29, 1920. Dialkyl sulfates are obtained by heating the corresponding alcohols or ethers with alkali pyrosulfates or chlorosulfonates or mixts. thereof, and distg. *in vacuo*; or the alc. vapor may be passed over the heated pyrosulfate. Examples of both methods are given as applied to the production of Et<sub>2</sub>SO<sub>4</sub> from EtOH and Na<sub>2</sub>S<sub>2</sub>O<sub>7</sub>. Methyl, propyl, and butyl ales. and ethers also are specified as initial materials.

**Esters of dihydroxydiethyl sulfide.** G. KRÄNZLEIN and M. CORELL. U. S. 1,422,889, July 18. (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>S can be esterified with Ac<sub>2</sub>O or HOAc or with HCO<sub>2</sub>H or benzoic or phthalic anhydrides. The acetic ester b<sub>m</sub> 142–150°. Thiodiglycol when heated in a vacuum with 2N H<sub>2</sub>SO<sub>4</sub> yields a residue on distn. which is gum-like and Al(OH)<sub>3</sub> produces a similar jelly-like compn. These products may be used in the manuf. of films, as softening agents, or as pharmaceutical products.

**Purifying maleic acid.** G. C. BAILEY, C. W. FISCHER and J. F. W. SCHULZE. U. S. 1,424,138, July 25; cf. C. A. 16, 935. Maleic acid which is associated with benzoquinone as an impurity is purified by distn. with xylene, which facilitates fractionation.

**Evaporating urea solutions.** METALLBANK UND METALLURGISCHE GRS. Brit. 177,056, March 17, 1921. Urea solns. are evapd. and dried by spraying the soln. into contact with a warm gaseous drying medium. The urea soln., preferably previously concd. *in vacuo*, is distributed horizontally in the form of mist into a current of gaseous drying medium, which is so directed as not to disturb the horizontal flow of the mist. The horizontal distribution, and disintegration into mist, may be effected by dropping the liquid on to a disk revolving at high speed. An almost completely dehydrated urea is obtained, in granular form, without loss of N.

**Dicyanodiamide.** H. C. HETHERINGTON and J. M. BRAHAM. U. S. 1,423,799, July 25. Lime-nitrogen is extd. with H<sub>2</sub>O and the soln. obtained is filtered and treated with sufficient H<sub>2</sub>SO<sub>4</sub> to combine with half the Ca present, the CaSO<sub>4</sub> is removed and the remaining soln. is treated with H<sub>2</sub>SO<sub>4</sub> in finely divided streams, the additional CaSO<sub>4</sub> formed is removed and the dicyanodiamide is recovered, *e. g.*, by concn., cooling and crystn.

**Diphenylamine.** A. P. TANBERG. U. S. 1,422,494, July 11. Aniline is condensed to form Ph<sub>2</sub>NH by heating under pressure in the presence of 1% of HCl, which serves only as a catalyzer.

**Diphenylguanidine.** M. L. WEISS. U. S. 1,422,506, July 11. Diphenylguanidine contg. carbodiphenylimide as an impurity is dissolved in hot toluene and the crystals obtained on cooling are washed with pure toluene and are then dried.

**Sulfonating organic compounds.** A. R. GROB and C. C. ADAMS. U. S. 1,422,564, July 11. A medium of liquid SO<sub>2</sub> is used in sulfonation of compds. such as C<sub>6</sub>H<sub>6</sub> with gaseous SO<sub>3</sub>.

**Aromatic nitroamines from chloronitro compounds.** L. HAAS. U. S. 1,423,494, July 18. 1,2,4-ClC<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>2</sub> is introduced into a soln. formed by satn. of strong HOAc with NH<sub>3</sub> and additional NH<sub>3</sub> is passed into the reacting materials while they are maintained at 125–130° to produce dinitroaniline. The following compds. may be similarly produced: 1,4,3,5-chloroaminodinitrobenzene, 1,2,4,3,5-chlorodiaminodinitrobenzene, 1,2,4-aminochloronitrobenzene, 2-aminonitrobenzene.

**Aromatic amino alcohols.** A. GAMS and E. WYBERT. U. S. 1,423,191, July 18. 1,3,4-MeNHCH<sub>2</sub>COC<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> and *d*-tartaric acid soln. are treated with a Pt soln. and shaken with H<sub>2</sub>, the Pt is sepd. and crystals which have formed are sepd. The filtrate is evapd. to dryness and dissolved in MeOH. On seeding with a crystal, the

$l$ -(HO) $_2$ C $_4$ H $_2$ CH(OH)CH $_2$ NHMe tartrate seps. leaving the  $d$ -compd. in soln. The solid compd. is sepd. and treated with NH $_3$  to liberate the free base which is *adrenaline*. EtNHCH $_2$ COC $_4$ H $_2$ (OH) $_2$  may be similarly treated.

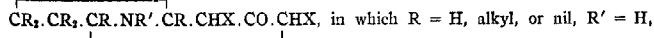
**Formaldehyde and hexamethylenetetramine.** C. B. CARTER and A. E. COXE. U. S. 1,423,753, July 25. Ozonized air or ozonized O is combined with C $_6$ H $_4$  in the presence of steam in order to obtain a high yield of CH $_2$ O without accumulation of explosive ethylene ozonide. The CH $_2$ O is either recovered as such or is converted into (CH $_2$ ) $_6$ N $_4$ . A yield of 70% CH $_2$ O and 15% formic acid may be obtained. If (CH $_2$ ) $_6$ N $_4$  is to be obtained, NH $_4$ OH is added to the reaction products contg. CH $_2$ O and the (CH $_2$ ) $_6$ N $_4$  may afterward be extd. with CCl $_4$  and crystd.

**Naphthalic and other dicarboxylic acids.** A. G. WILLIAMS. U. S. 1,423,980, July 25. Naphthalic acid is prepd. from 7,8-dihydroxyacenaphthylene by dissolving it in an alk. soln. such as NaOH and oxidizing with Na $_2$ O $_2$  or a current of air. Diphenic acid may be similarly, prepd. from phenanthraquinone. Retenequinone, fluoranthenequinone, chrysenequinone, picenequinone and analogous compds. also may be similarly converted into dicarboxylic acids.

**Anthraquinone derivatives.** D. SEGALLER, D. H. PEACOCK and BRITISH DYE-STUFFS CORPORATION, LTD. Brit. 176,925, Dec. 30, 1920. 1-Hydroxy-4-anthraquinonesulfonic acid is obtained by heating phthalic anhydride and phenol or phenol- $p$ -sulfonic acid in H $_2$ SO $_4$  contg. boric acid at about 200°; further heating of the 1-hydroxy-4-anthraquinonesulfonic acid, after isolation or not, in H $_2$ SO $_4$  at 240–250° gives quinizarin; the production of quinizarin from phthalic anhydride and phenol may be effected in one operation; catalysts such as HgO may be added. If 2,4-phenoldisulfonic acid is employed or formed, 1-hydroxy-2,4-anthraquinonedisulfonic acid and purpurin are obtained. If phenol is replaced by  $o$ - or  $m$ -cresol, the corresponding products are, resp., 1-hydroxy-2-methyl-4-anthraquinonesulfonic acid or 1-hydroxy-3-methyl-4-anthraquinonesulfonic acid. The final product in each case is 2-methylquinizarin;  $p$ -cresol gives directly 1-hydroxy-4-methylantraquinone.

**9,10-Dihaloanthracene- $\beta$ -sulfonic acids.** K. SCHIRMACHER. U. S. 1,422,889, July 18. Fuming sulfuric acid is allowed to react upon 9,10-dihaloanthracene in the presence of PhNO $_2$  or other inert vehicle.

**Nortropinone derivatives.** E. MERCK, O. WOLFE and H. MAEDER. Brit. 177,807, April 1, 1922. Nortropinone and its derivs. of the general formula



hydrocarbon radical, or substituted hydrocarbon radical, and X = H, carboxyl, or CN, are obtained by condensation of 1,4-dialdehyde or diketo compds. with NH $_3$  or a primary amine and a deriv. of acetone; tropinonemonocarboxylic ester is excepted. Examples are cited.

## 11—BIOLOGICAL CHEMISTRY

PAUL R. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Vital activity and structure of the cell.** J. VAN MOLLÉ. *Naturwetenschapp. Tijdschr* 3, 227–34, 252–6(1921).—The article contains extensive considerations on well known physico-chem. phenomena, such as colloidal swelling and osmotic pressure, regarding their possible influence on vital phenomena. M. discusses also the structural peculiarities of the cell and their possible influence on cellular activity. R. BRUTNER



**The formation of colloidal copper in urine containing sugar.** L. DE JAGER. *Nederl. Tijdschr. Genees. Kunde* 65, 1, 2006-9(1921).—Five cc. urine contg.: sugar, 7 drops 20% NaOH and 5 drops 10%  $\text{CuSO}_4$  are boiled in a test tube. The mixt. becomes dark yellow; after standing it suddenly becomes turbid and drops a brown or black ppt. At this moment the liquid is rapidly filtered. The ppt. on the filter is washed with water; by washing the color of the ppt. becomes light red while a brown colloidal soln. passes the filter. J. explains these observations by the assumption that colloidal  $\text{Cu}_2\text{O}$  and colloidal Cu are formed. The possibility of redissolving the Cu ppt. as a colloidal soln. is due to the presence of protecting colloids which are known to be present in the urine. If the colloidal soln. is boiled a long time a non-colloidal Cu ppt. is formed which cannot be dissolved. The colloidal solns. do not show the reactions of Cu salts.

R. BRÜTNER

**Mendelian splitting and chemical equilibrium.** O. RENNERT. *Biol. Zentr.* 40, 268-77(1920); *Expt. Sta. Record* 44, 726.—R. undertakes to refer Mendelian splitting to chem. characters and behavior. Criticism. E. LEHMANN. *Ibid* 277-88. H. G.

**Production and inspection of biological products.** D. I. SKIDMORE. *J. Am. Vet. Med. Assoc.* 59, 51-61(1921); *Expt. Sta. Record* 45, 578.—In addn. to a brief explanation of the classification, supervision, and control of establishments licensed for the production of biol. products, the prepn. and properties of clarified antihog-cholera serum (Skidmore, *N. Am. Vet.* 2, No. 3, 104-7(1921)) are described, and comparative tables are given of the compn. of the different serums manufactured. H. G.

**Inbreeding and the biochemical specificity of the individual.** L. LÖHNER. *Riv. biol.* 3, No. 2, 129-49(1921); *Expt. Sta. Record* 45, 772.—Inbreeding is followed in all animals and plants by the same set of pathol. conditions, which constitute a characteristic syndrome not produced in any other way. The idea that these conditions can be explained by the combination of hereditary factors is rejected, and the theory is proposed that the harmful results of inbreeding come from the too great biochem. similarity of the parents. The offspring of related parents have chem. characters not conducive to the thorough functioning of the enzymes and hormones concerned in growth and development. H. G.

**Condition foreign to body, blood and cell.** EMIL ABDERHALDEN. *Arch. ges. Physiol. (Pflüger)* 185, 322-3(1920).—A discussion of substances which are foreign to the cells or blood on account of their chem. compn., mol. structure, or degree of aggregation. JOSEPH S. HEPBURN

**Löhner's marginal eminence in the germ-free area as a support of Arndt's fundamental law.** W. SIFFERT. *Biochem. Z.* 129, 50-63(1922).—Confirmation was obtained that a marginal eminence can develop simply on the basis of a favorable medium. In the formation of the oligodynamic marginal eminence, the chief part is played by oligodynamic substances as may be exptly. demonstrated. Such an eminence may therefore be properly classified as a special instance of Arndt's fundamental law. The theoretical views, which have been developed by some investigators, concerning the processes of diffusion in nutrient media pay too little attention to the complicated character of the actual conditions. A bibliography of 54 references is appended. JOSEPH S. HEPBURN

**Ultra-violet absorption spectra and optical rotation of the proteins of the blood sera.** S. J. LEWIS. *Proc. Roy. Soc. (London)* 93B, 178-94(1922).—Study was made of the contribution of each protein constituent of the serum to the ultra-violet absorption spectrum curve of blood serum. The absorption curve for pseudoglobulin was const., and the same for both the horse and human varieties. The absorption curve for euglobulin differed considerably from that for pseudoglobulin in extinction coeffs, but not in general form; hence the differences between these globulins do not result from differ-

ences in the structure of the chem. mol. The absorption curves for the horse and human varieties of albumin were the same, except for a const. ratio in their magnitudes; this difference may be due to the physical, or possibly chem., association of an aggregate, which possesses little or no selective absorptive power (e. g., an aliphatic amino acid or a polypeptide) with the principal or absorbing aggregate. All the curves showed a close similarity in form when corrected to a common amplitude, and nearly all the amplitudes were simple multiples of a common factor; these facts point to a similarity of constitution among these proteins and to a variable concn. of the active group. The absorption bands for the horse proteins were somewhat greater than those for the human proteins. The following sp. rotations were "adopted" as the result of actual measurements: horse pseudoglobulin  $-52^\circ$ , human pseudoglobulin  $-46^\circ$ , horse euglobulin  $-43^\circ$ , human euglobulin  $-48^\circ$ . Horse albumin had a sp. rotation of  $-57.40^\circ$ ; human albumin from normal serum ranged between  $-50.58^\circ$  (1st. crop) and  $-54.83^\circ$  (2nd. crop); human albumin from ascitic fluid (4 samples) ranged between  $-55.05^\circ$  and  $-65.36^\circ$ . The sepn. and purification of the proteins was also studied.

JOSEPH S. HEPBURN

Recent advances in science—biochemistry. J. C. DRUMMOND. *Sci. Progress* 17, 31-5(1922).—Review of recent work on the biochemistry of milk, methods for the detection and detn. of vitamins, chemotropism, proteins and amino acids, N of the urine, the pituitary gland, and the lecithin of the liver.

JOSEPH S. HEPBURN

Aluminium in the life of organisms. JULIUS STOKLASA. *Umschau* 26, 134-5 (1922).—All the plant organs of the Xerophytes, which are dry-land plants, have a low Al content. The hydrophilous plants, which grow in or near water, are characterized by a high Al content; this is especially true of the cryptogams such as the algae. In the higher hydrophilous plants, the concn. of Al is always greater in the subterranean parts than in those above ground; Al is stored in the reserve material of their seeds. The roots of the halophytic plants are rich in Al. The mesophytes prefer land and atm. of medium moisture content; when these plants grow in a dry place, all their parts are quite poor in Al; when they grow on swampy soil they contain considerable amts. of Al especially in their roots. When plants are growing in a nutrient medium containing more Fe than they require for their development, the excess Fe accumulates and produces disturbances in their cells; however, if Al be present, it retards the entrance of the Fe into the root system and thereby protects the plant. Al, Fe, and Mn play a part in the formation of the pigments of the blossoms. Al also plays a part in the formation of blue, violet, red, and blue-green pigments in beetles and birds. Compds. of Al impart the color to many precious stones. Al is present in the blood of animals. During the carboniferous age, Al promoted the growth of plant life, and made possible the coal deposits of the present day.

JOSEPH S. HEPBURN

Physico-chemical examination of hemoglobin. State of aggregation of hemoglobin molecules. M. CAMIS. *Folia Haematologica* 2, 149-211.—The surface tension of dialyzed hemoglobin solns., measured stalagmometrically, decreases with rise of temp. and increases with increase of concn. up to 6%. Addn. of 0.006-0.1% of lactic acid to a soln. of hemoglobin or laked blood diminishes surface tension and lowers the extinction coeff. Both effects are attributable to a decrease in the no. of particles. It is supposed that the presence of lactic acid in blood leads to an aggregation of hemoglobin mols.

J. C. S.

The oxidizing enzymes in normal and pathological conditions. G. MARINESCO. *Bul. soc. chim. Romania* 4, 3-12(1922); cf. *C. A.* 14, 3454; 15, 2664.—A review of work previously reported together with further histological investigations chiefly in embryonic nervous tissue.

GEORGE ERIC SIMPSON

Recent results of protein researches. K. FELIX. *Z. angew. Chem.* 35, 272-5 (1922).—A review.

GEORGE ERIC SIMPSON

**Mechanism of amylase action.** H. LÖRPS AND W. WASMUND. *Fermentforschung* 5, 169-235(1922).—Using malt amylase the effect of substrate concn., enzyme concn., diln. at the same relative enzyme-substrate concn., temp., addn. of reaction products, properties of substrate and H-ion concn. were studied. The theoretical significance of the data is considered at some length.

R. L. STEHLÉ

Is the autolysis of amylose described by Biedermann an enzymic process? E. ROTHLIN. *Fermentforschung* 5, 236-53(1922); cf. *C. A.* 15, 3647.—The autolysis of amylose depends neither upon new formation of enzyme nor upon an activation of zymogen rests but results from contamination with bacteria or fungi. Answer. W. BIEDERMANN. *Ibid* 254.—B. attributes the failure of Rothlin to confirm his results to unwarranted variations in procedure.

R. L. STEHLÉ

Asymmetric syntheses by means of enzyme action. IV. L. ROSENTHALER. *Fermentforschung* 5, 334-41(1922); cf. *C. A.* 4, 2673.—HCN and emulsin together with citronellal, isovaleraldehyde, *p*-tolylaldehyde or chlorobenzaldehyde gave optically active nitriles. In such reactions catalyzed by emulsin the equil. point is displaced and the velocity consts. diminish. The trimol. reactions between HCN, NaOH and several aldehydes were studied and the reaction consts. calcd.

R. L. STEHLÉ

ABDERHALDEN, E.: Textbook of Physiological Chemistry. II. Inorganic Nutrients.—The Significance of the Physical State of Cell and Tissue Constituents for their Functions.—The Ferments, their Action and Significance.—Hitherto Unknown Nutrients with Specific Action.—Problems of Total and Energy Metabolism.—Metabolism of Special Organs and Cells. 4th Ed. Revized. Berlin and Vienna: Urban & Schwarzenberg. 723 pp.

HARROW, BENJAMIN: Glands in Health and Disease. New York: E. P. DUTTON & Co. 218 pp. \$2.50.

LEVY, A. GOODMAN: Chloroform Anesthesia. London: John Bale, Louis & Daniellson, Ltd. 7s. 6d.

LOEB, JACQUES: Proteins and the Theory of Colloidal Behavior. New York: McGraw-Hill Book Co. 292 pp. \$3.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Rapid detection of bismuth in urine and saliva. DOMENICO GANASSINI. *Boll. chim. farm.* 61, 321-6(1922).—The reaction of Vanino and Treubert (*Ber.* 31, 1213, 2267) was found to be a very delicate test for Bi in the urine of syphilitics treated with Bi salts. To 10 cc. of urine add 2 cc. of a 10% soln. of  $\text{SnCl}_2$ , then 5 cc. of a 20% NaOH soln. and shake. In the presence of Bi the white ppt. gradually assumes a brownish or black color. This test is more delicate than the brown or black color obtained by boiling with glucose. Urine contg. Bi sometimes deposits black  $\text{Bi}_2\text{S}_3$  when allowed to putrefy. The  $\text{Na}_2\text{SnO}_2$  test may also be applied to saliva.

A. W. DOX

Modification of the chlorometric method of Hayem and Winter. J. MALGOYRE. *Bull. soc. pharm. Bordeaux* 60, 59-64(1922).—M. proposes to shorten the process of Hayem and Winter by treating the gastric juice with a reagent prepared by dissolving 2 g. of chromic acid in 100 cc. of EtOH (95%) to remove the proteins and then to titrate directly. He detcs. the free and total HCl by titrating according to the method of Topfer-Linossier. The combined acid is found by difference. Total Cl is obtained by neutralizing 10 cc. of gastric juice with a satd. soln. of  $\text{Na}_2\text{CO}_3$ , adding 10 cc. of the chromic acid reagent, filtering, and titrating with 0.1N  $\text{AgNO}_3$ . The fixed Cl is equal to the difference between the total Cl and total acidity. The results obtained by M.'s method and by the method of Hayem and Winter correspond very closely.

A. G. DUMÉZ

**Identification of traces of true albumin in urine. Separation of pseudoalbumins.** M. RENOUX. *J. pharm. Belg.* 4, 381-2(1922).—As a result of tests with a soln. of egg albumin, R. concludes that either neutral crystals of  $\text{Na}_2\text{SO}_4$  or  $\text{MgSO}_4$  may be used for the defecation of urine (after being made alk.), preparatory to testing for traces of true albumin.

A. G. DUMÉZ

**An objective method of demonstrating the coagulation of blood.** R. J. WOLVIUS. *Verslag. Akad. Wetenschappen Amsterdam* 30, 420-3(1921).—A method is described whereby the coagulation time of blood can be recorded in the form of a curve by means of a string galvanometer.

E. B. FINK

**New observations upon the protective action of the cerebrospinal fluid in the mastix reaction.** KARL PRESSER AND ALFRED WEINTRAUB. *Z. Immunität.* 33, 317-24 (1921).—Cerebrospinal fluid, whether normal or pathol., is alk. in reaction. This alkalinescence has a relatively const. value. Spinal fluid from which the colloids have been removed by animal charcoal is able to protect mastix from pptn. by  $\text{NaCl}$ ; the dialysate of spinal fluid has a similar action. This protective action is due to the alkalinescence of the fluid, is increased by increasing the alk., and disappears on neutralization. The action of alkali is probably due to sapon. of the fatty acids contained in mastix.

E. B. FINK

**Detection of minute amounts of substances by chemical and physiological methods.** ISRAEL S. KLEINER. *J. Am. Inst. Homeopathy* 15, 130-3(1922).—Review with bibliography.

JOSEPH S. HEPBURN

**Variations in the diastatic power of the urine in relation to its reaction, with a suggested method for the estimation of the diastase content.** E. C. DODDS. *Brit. J. Exptl. Pathol.* 3, 133-7(1922).—The original technic for the diastase reaction is criticized because it takes no account of the varying reaction of normal urine. It was proved that the optimum reaction for urinary diastase in the presence of phosphate was  $p_H$  6.1, as in the case of the salivary diastase compd. A modified technic is described whereby the urine is dild. with a phosphate buffer soln., thus bringing all urines to the optimum  $p_H$  before its starch-digesting power is tested. Ammoniacal decompn., by making the urine more alk., decreases the diastatic power as detd. by the old method, but has no effect on the method suggested. Diastase tends to cling to urinary deposits, hence all urines should be well shaken before the estn. is made.

H. F. H.

**Micro-estimation of albumin.** C. VALLÉE AND M. POLONOVSKI. *Compt. rend. soc. biol.* 84, 901-903(1921).—The total N is estd. in 1 cc. of the liquid under examn. by the method previously described (*C. A.* 16, 3045). In a further 2-3 cc. of the liquid the albumin is pptd. by addition of two drops of glacial acetic acid and a small quantity of  $\text{NaCl}$ , and heating on a water bath at  $90^\circ$ . The liquid is made up to the original vol., centrifuged, and the N estd. in an aliquot portion of the clear liquid. The albumin N is thus obtained by difference.

J. C. S.

**Colorimetric estimation of the concentration of hydrogen ions in very small quantities of blood by dialysis.** J. LINDHARD. *Compt. rend. trav. lab. Carlsberg* 14, No. 13, 13(1921).—A modification of the method of Dale and Evans (*cf. C. A.* 15, 2462), in which the required quantity of blood is reduced to 3 drops, so that the process can be applied repeatedly by finger pricks. Hirudin is used, with phenolsulfonphthalein as indicator. The dialysate is not titrated but compared with a color scale of phosphate-indicator mixts. The error for the dialysis of phosphate mixts. compared with a sep. scale is about  $p_H$  0.02, but compared with the original mixt. the  $p_H$  agrees in the second place of decimals. Bicarbonate solns. gave by the electrometric method a  $p_H$  0.2 to 0.3 higher than by the colorimetric, but this discrepancy L. attributes to loss of  $\text{CO}_2$  in dialysis and inapplicability of the electrometric control (*cf. Evans, C. A.* 16, 1266).

J. C. S.

**New methods of blood sugar estimation.** Estimation of the true sugar content of urine. D. G. COHEN-TERVAERT. *Nederl. Tijdschr. Geneesk.* 65, ii, 857-84, 3065-9 (1921); cf. *C. A.* 15, 1548. (A).—The methods of Shaffer and Hartmann (*C. A.* 15, 1328), Folin and Wu (cf. *C. A.* 13, 2541), and of Ponder and Howie (*C. A.* 15, 2893) deserve full recommendation. The first-named has been worked out for 0.1-0.2 cc. of blood. (B).—Sumner's method (*C. A.* 15, 2647) has been compared with a fermentation method due to Nagasaki (*C. A.* 10, 209) and found to be very accurate. A few small modifications were introduced. J. C. S.

**Estimation of sugar in small quantities of blood by the Pavy-Sahli method.** S. H. RÆST. *Schweiz. med. Wochschr.* 51, 419-23.—0.1 cc. of blood is washed into a test-tube with 3 cc. of alc. The mixt. is shaken for  $1\frac{1}{2}$  hr., filtered through hardened filter-paper, and the residue washed twice with 2 cc. of alc. The alc. is then removed over a water bath and 0.3 cc. of Pavy's solns. and 1.8 cc. of water are added. The liquid is heated to boiling and while boiling titrated with standard (approx. 0.1%) dextrose soln. J. C. S.

**Sources of error in the Epstein method for blood sugar determination and a modified technic.** C. M. WILHELMJ. *J. Lab. Clin. Med.* 7, 489-94(1922). E. R. LONG

**Suggestions for the determination of uric acid in blood.** L. BAUMAN AND L. M. KEELER. *J. Lab. Clin. Med.* 7, 551-2(1922).—These investigators have replaced the standard uric acid soln. with Lovibond tintometer glasses. The Folin-Wu method is followed, 20 cc. of protein-free filtrate corresponding to 2 cc. of blood being used. The blue compd. is developed in 25 cc. flasks without the use of  $\text{Na}_2\text{SO}_4$ , as the glasses are calibrated against the standard uric acid soln. of Benedict and Hitchcock. The glasses are placed over the upper end of the immersion cylinders, or prisms, of the Duboscq colorimeter. A red glass (0.4) is placed over the unknown soln. and a blue glass (2.9) over the opposite prism, the latter being immersed to the 20 mm. mark in distd.  $\text{H}_2\text{O}$ . It requires a depth of 17.6 mm. of the blue soln. obtained with 0.1 mg. of uric acid dild. to 50 cc. to match the colored glasses. The following formula is used to obtain the amt. of uric acid (in mg.) contained in 100 cc. of blood:  $(17.6 \times 100)/(\text{reading of unknown})/(25 \times 2)$ . The glasses may also be used with the Bock-Benedict colorimeter if the red glass is placed over the immersion cylinder and the blue in front of and parallel to the standard cell. The Lovibond glasses have been found to be satisfactory for the estn. of uric acid in practically all samples of blood which are ordinarily sent to a hospital lab. The advantages of the glasses are (1) that they shorten the time of the procedure and (2) that they remove the uncertainty arising from the possible decompn. of the standard uric acid soln. The annoying pptn. occasionally encountered in this method may be avoided by the addn. of 3 drops of half satd. (in the cold) gum acacia soln. A crystal of thymol is added to the gum soln. to avoid bacterial decompn. The acacia probably acts as a protective colloid. E. R. LONG

**The use of open delivery tubes in the distillations when determining urea and non-protein nitrogen in blood.** GUY E. YOUNGBURG. *J. Lab. Clin. Med.* 7, 552-4 (1922). E. R. LONG

**An adapted mask for basal metabolism apparatus.** PHILIP B. NEWCOMB. *J. Lab. Clin. Med.* 7, 560-2(1922). E. R. LONG

**The making of collodium sacs.** NATHAN MUSKIN AND LOUIS SIEGEL. *J. Lab. Clin. Med.* 7, 564(1922). E. R. LONG

## C—BACTERIOLOGY

A. K. BALLS

**The effect of substituting uranium for potassium in growth media.** R. A. PETERS. *Proc. Physiol. Soc., J. Physiol.* 54, ii(1921).—U cannot be substituted for K in culture

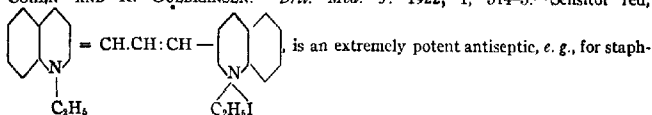
media for colpidia. When U and K were both present, however, the result seemed to be better than with K alone.

J. F. LYMAN

**Influence of hydrogen ion on the growth of Azotobacter.** P. L. GAINES AND H. W. BACHELOR. *Science* 56, 49-50(1922).—For several strains of *Azotobacter* isolated from different soils and grown in dextrose media of different H-ion concns. the max.  $p_H$  value permitting growth was 5.9-6.0. As H-ion concn. decreased growth increased until  $p_H$  6.1-6.4 was reached. No N was fixed in media of higher H-ion concn. than  $p_H$  5.9. Fixation in concns. of 6.3-6.5 was as great as in lower concns. The optimum reaction for fixation of N appeared to be very close to the optimum for growth. The total acid produced by the various cultures was negligible. This indicated the production of inappreciable quantities of either acidic or basic metabolic by-products by these organisms.

M. S. ANDERSON

**The antiseptic properties of cyanine dyes.** C. H. BROWNING, J. B. COHEN AND R. GULBRANSEN. *Brit. Med. J.* 1922, I, 514-5.—Sensitol red,



ylococci in  $H_2O$  medium. Selective action as between staphylococcus and *B. coli* is exhibited to a higher degree by such dyes than by any other compd. hitherto investigated, e. g., for sensitol red the ratio of the sterilizing concns. is probably greater than 2000 : 1. Sensitol green is the most active of these dyes for *B. coli*. Cf. C. A. 15, 106.

A. T. C.

**A rapid method of determining the presence and type of botulinus toxin in contaminated foods.** P. F. ORR. *J. Infectious Diseases* 29, 287-90(1921); *Expt. Sta. Record* 46, 467.

H. G.

**The thermal death point of the spores of Bacillus botulinus in canned foods.** H. WEISS. *J. Infectious Diseases* 29, 362-8(1921); *Expt. Sta. Record* 46, 670.

H. G.

**Ester-forming yeasts.** U. WEBER. *Biochem. Z.* 129, 208-16(1922).—W. reports the results of studies with 4 yeasts and 2 organisms from the group of "Fungi Imperfecti," on vegetative development, ester formation and fermentation. The method of estn. of ester formation was the simple one of olfactory stimulation. Typical reactions did not occur in all cases. There were samples where, in spite of vigorous growth, no ester formation was detectable, such as in an atm. of  $CO_2$ . Esters arose only when there was simultaneous fermentation of carbohydrate which afforded energy for the destruction of protein, or when energy was liberated which took over the role of the carbohydrates. When alc. was added a qual. alteration in the character of the ester odor was noticed. The use of various N-contg. nutrient media produced changes in the odor only if there occurred a simultaneous change in the amino acids. When leucine was added the odor of amyl ester was present.

F. S. HAMMETT

**A new technic for the preparation of Bacillus acidophilus milk and its therapeutic value.** A. A. EGGSTON AND N. P. NORMAN. *N. Y. Med. J.* 115, 683-5(1922).

F. S. HAMMETT

**Studies on lactic fermentation. Memory in the bacteria.** CHARLES RICHET, EUDOXIE BACHRACH AND HENRY CARDOT. *Compt. rend.* 174, 842-5(1922).—When even a slight intoxication of short duration has affected bacteria, succeeding generations show a "remembrance" of it long after they have recovered an apparently normal state. With the lactic bacillus this phenomenon may be one of acquired tolerance or of anaphylaxis, as shown by growing the bacterium in cultures contg.  $K_2HAsO_4$ . The conclusions of this study have a bearing on problems of heredity and of personal idiosyn-

crasy. It is proved by the expts. that when 2 cultures of bacteria of the same species have lived even a very short time in media slightly different, the bacteria will be different.

L. W. RIGGS

**Energy product in the growth of *Aspergillus niger*.** E. F. TERROINE AND RENÉ WURMSER. *Compt. rend.* 174, 1435-7(1922).—The "ratio of utilization" of glucose by *A. niger* was detd. by comparing the dry wt. of mycelium formed with the wt. of glucose consumed and is about 44 to 100 (cf. *C. A.* 16, 732). The heat of combustion of mycelium is 4.8 cal. per g. and of glucose 3.76 cal. per g. The energy product is  $(4.8 \times 0.44) \div 3.76 = 0.56$ . But the combustion of glucose in the culture medium is not complete; therefore a combustion of the medium was made before and after the culture of *A. niger*, with the results 6.46 and 0.51, resp. The difference of these figures, 5.95, represents the metabolizable energy,  $U$ . The mycelium on combustion gave 3.55 cal. =  $U'$ .  $\text{CO}_2$  evolved during growth was 408.8 cc. which multiplied by the factor 0.005 gave the equiv. of 2.04 cal. =  $U''$ . From these figures  $U - (U' + U'') = 0.36$ . The ratio of the energy stored in the mycelium to the metabolizable energy  $U$ , or  $3.55 \div 5.95$ , = 59.6%. Such a calcn. gives only the apparent product as related to growth. To obtain the real product it is necessary to deduct from the total quantity missing from the medium that which has served for maintenance. Mycelium placed in the medium of Czapek does not grow but disengages  $\text{CO}_2$  from which is calcd. a min. value of the maintenance energy. The consumption of glucose by *A. niger* is at any instant the sum of 2 terms: (1) a term proportional to the rate of growth and which represents the amt. of glucose which should disappear to form the substance of the mycelium, (2) a term proportional to the wt. of mycelium already formed at that instant and which represents the consumption for maintenance, or  $c = p[a + (bt/2)]$  in which  $c$  = glucose consumed,  $p$  is the dry wt. collected,  $a$  is const. and is the wt. of glucose consumed to produce 1 g. of mycelium,  $b$  = a const. which is the maintenance consumption per g. of mycelium per hr. and  $t$  = time in hrs. The mean of 5 expts. gives  $b = 8.2$  cc. of  $\text{CO}_2$  per g. of mycelium per hr. which is denoted by  $R$ . The yield,  $U \div (U - R)$ , gives 66 to 70% which shows that the energy product of the growth of *A. niger* is very high.

L. W. RIGGS

**Destruction of lactic acid by yeast cells.** F. LIEBEN. *Oesterr. Chem. Ztg.* 25, 87-90(1922).—Carbohydrates are, under conditions of strain, changed in the muscle to lactic acid. There are indications that the latter is then partly oxidized to  $\text{CO}_2$  and partly reconverted into a carbohydrate (*C. A.* 15, 2307). The question of the transformation of lactic acid was studied by expts. *in vitro* with yeast. The following method was used for detg. lactic acid: Protein was pptd. with  $(\text{NH}_4)_2\text{SO}_4$ , the lactic acid extd. with  $\text{AmOH}$  in the presence of  $\text{H}_2\text{SO}_4$ , and from this again extd. with dil.  $\text{Na}_2\text{CO}_3$  soln. The extn. was repeated 5 times. The ext. was exactly neutralized, methyl red being used as indicator, and the remaining  $\text{AmOH}$  removed by blowing steam through the soln. The lactic acid was then oxidized with 0.02  $N$   $\text{KMnO}_4$  in presence of 0.5%  $\text{H}_2\text{SO}_4$ . The  $\text{AcH}$  was distd. over into  $\text{KHSO}_4$  of known titer, and the excess  $\text{KHSO}_4$  titrated with  $\text{I}$ . In the expts. proper, fresh yeast was suspended in a soln. of  $\text{Na}$  lactate ( $d$ - or  $r$ -) and a swift current of air or  $\text{O}$  passed through under brisk agitation, the gases being permitted to escape freely. Under these conditions 4-5 g. lactic acid are 95-97% destroyed in 7-8 hrs. by 50 g. yeast. Variations in temp. and pressure have no noticeable effect.  $\text{C}$  balances showed that the lactic acid is partly oxidized to  $\text{CO}_2$ , and partly assimilated by the yeast, probably after first reverting to the carbohydrate form.  $\text{EtOH}$  and glucose give results similar to those obtained with lactic acid. Tartaric and succinic acid under the same conditions are neither oxidized nor assimilated by the yeast, while alanine, glycocoll and aspartic acid are assimilated, but not oxidized. The results show that carbohydrates and closely related products form a group by themselves in their relation

to life processes, and that there is a distinct parallelism between their transformation in the muscle and that under the influence of yeast cells. F. W. ZERRAN

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## D—BOTANY

B. M. DUGGAR

**The growth of field corn as affected by iron and aluminium salts.** CHAS. H. ARNDT. *Am. J. Botany* 9, 47-71 (1922).—Field corn was grown in 2 diversely constituted nutrient solns. to det. the effect of compn. of these solns. upon the amt. and form of Fe necessary for optimum growth, and also to det. the toxicity of  $H_2SO_4$ ,  $HNO_3$  and  $HCl$  together with their corresponding salts of Fe and Al. The availability of Fe in  $FePO_4$  was found to depend largely upon the compn. of the nutrient soln. Seven mg. of  $FePO_4$  per l. was sufficient in one soln. and 5 times this amt. insufficient in another. 0.0005  $N$   $FeSO_4$  gave optimum growth in one case and the addn. of  $Fe(NO_3)_3$  produced a ppt. from which the plant could not obtain sufficient Fe from a 0.001  $N$  soln.  $H_2SO_4$ ,  $HNO_3$  and  $HCl$  were about alike in their toxicity when they were added to the nutrient solns. in low concns. At higher concns.  $H_2SO_4$  depressed the growth of tops more than the other 2 acids but was more favorable to root development. Initial H-ion concns. less than  $p_H$  3.7 had little effect on the rate of growth. Sand cultures required much more acid than water cultures to produce the same results. The toxicity of  $FeSO_4$  showed no relation to the initial H-ion concn. Al salts produced about the same depression in growth as the same normality of  $FeSO_4$ . Fe salts when present in injurious concns. produced a reddish brown discoloration on the lower portion of the nodal area. Al salts collected in the same position but produced no discoloration. M. S. ANDERSON

**Hydrogen-ion concentration in its relation to wheat scab.** E. F. HOPKINS. *Am. J. Botany* 9, 159-79 (1922).—A study of the pathogen *Gibberella Saubinetii* shows that although a wide range of acidity is tolerated by wheat seedlings there is a minimum in the growth curve which varies from about  $p_H$  5.5 to  $p_H$  6.0. The use of various substances to change the reaction shows that the effect on the growth is due to the H-ion concn. and not to other mols. or ions. There is also a correlation in the relation of soil acidity to seedling infection where a minimum of  $p_H$  5.5 is obtained. Furthermore, there is an effect on the germination of wheat which also shows a minimum. It appears therefore that soil acidity has an effect on the host as well as on the organism. M. S. A.

**The physiological balance in nutrient solutions for plant cultures.** W. F. GERICKER. *Am. J. Botany* 9, 180-2 (1922).—Wheat seedlings grown in nutrient solns. having varying combinations of ions show marked differences in growth. It is thought that the manner in which the ions are paired is important, and that one or more kinds of ion having opposite charges can best be used with the essential elements. M. S. A.

**Comparative studies of the action of salts of selenium, sulfur, and tellurium on plants.** B. TURINA. *Biochem. Z.* 129, 507-33 (1922).—This investigation is of particular interest to plant physiologists. Photomicrographs of root hair cells of normal barley, mustard, and *Lepidium* plants and of plants grown in the presence of the above salts are included. After germination studies were made, the plants being placed in pots and grown either in a nutritive soln. or in soil containing varying amts. of Se, Te, and S salts.  $SeO_3$  and  $SeO_4$  ions were tested on the 3 varieties of plants, the Na salts being used. S was studied with  $Na_2SO_3$  and  $Na_2SO_4$  solns., 8-day old rye and barley plants being grown in the presence of 0.035 to 0.067% S.  $Na_2TeO_3$  and  $Na_2TeO_4$  were tested on rye solns. varying from 0.01 to 0.1% Te being used. F. C. COOK

**The distribution of anthocyanidins in organic colors of plants.** ST. JONESCO. *Compt. rend.* 174, 1635-7 (1922); cf. C. A. 15, 4019.—The  $AmOH$  extn. method for



isolation of these pigments was applied to red, violet and blue colored plant tissue. The anthocyanidins appear characteristic of pure red organs and do not exist as colored pigments in a free condition in all colored tissue containing anthocyan. Plants such as beet, gladiolus, cobaea, canna, rose, and corn flower having purple-red, purple-violet, or blue colorations do not contain anthocyanidins but contain an anthocyan pigment, the coloration of which varies in each species of plant and an intense pure yellow pigment which dissolves in AmOH like the anthocyanides but is not a pseudo base.

F. C. COOK

Some causes of defective germination in wheat. A. J. PERKINS. *J. Dept. Agr. S. Australia* 25, 768-77(1922).—An address discussing soundness, age, and the general treatment and handling of seed; also the influence of soil and surrounding conditions on germination. A discussion of the influence of dipping the seed in  $\text{CuSO}_4$  and  $\text{HCHO}$  solns. is given.

F. C. COOK

The action of fluorescent dyes on the germination of seeds. A. PISKERNIK. *Sitzb. Akad. Wiss., Wien* 130, 1a, 189-214(1921).—Concns. of various photodynamic dyes varying from 1-600 to 1-1,000,000 were tested for 24 hrs. on the following seeds: *Pisum sativum*, *Vicia sativa*, *Lens esculenta*, *Sinapis alba*, *Triticum durum*, *Brassica oleracea*, *Lepidium sativum*, *Beta vulgaris*, and *Spinacia*. Fifty seeds were usually placed in the solns, some tests being made in the light and others in the dark. The resulting injurious action on germination and growth depended on the strength of light, the dye used, and the concn. employed. Controls were used. Eosin, saffron, Magdala red, and erythrosin were most active; methylene blue, rhodamine, and diazo-resorcin were less active. Fluorescein had slight activity. The degrees of injury to roots, stems, etc., are discussed in detail.

F. C. COOK

Notes on the chemical composition of some of the larger aquatic plants of Lake Mendota. I. *Cladophora* and *Myriophyllum*. H. A. SCHUETTE and A. E. HOFFMAN. *Trans. Wisc. Acad. Sci.* 20, 529-31(1922).—These 2 algae grow on rocks on the bottom of the lake. The material was air-dried, finely divided, and passed through a 60-mesh sieve before it was analyzed for ash, crude protein, ether ext., crude fiber, pentosans, and N-free ext.  $\text{SiO}_2$ , Cl,  $\text{SO}_4$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Mn}_2\text{O}_3$ , CaO, and MgO were detd. in the ash.

F. C. COOK

New investigations in regard to phosphoric acid assimilation in plants. A. STUTZER. *Z. angew. Chem.* 35, 250-1(1922).—A discussion, in the light of recent investigations, of the conditions involved in the most efficient utilization of phosphates.

P. R. D.

Oxalic acid in plants. N. PATSCHOVSKY. *Bol. Centr. Beihfte Abt. I.* 37, No. 3, 259-380(1920); *Expt. Sta. Record* 45, 528.—This is an elaborate account of the presence and significance of oxalic acid in plants throughout a wide systematic range.

H. G.

Protein crystalloid in the cells of albuca. R. F. SOLLA. *Osterr. bot. Zeit.* 69, 10-23(1920); *Physiol. Abstracts* 6, 228.—The protein crystalloid present in ground tissue at the beginning of organ development disappears early in the course of normal development, in epidermal cells it disappears only in those older cells showing signs of senescence. Long-continued darkening and hunger influence the crystalloids little. The function of the crystalloid and its method of origin are discussed.

H. G.

The participation of the lipoids in the metabolic exchanges of plant cells. II. FRIEDRICH BOAS. *Biochem. Z.* 129, 144-52(1922).—A continuation of previous studies (C. A. 15, 2901) in which the effects on cell permeability of solanine, sapotoxin, Na choleate, Na glycocholate, Na cholineate, Na taurocholate, urethan and quinine-HCl were investigated alone and in the presence of NaCl. The detrimental effect of these compds. is attributed to the production of an alteration of the colloid structure of the

cell lipoids, which interferes with permeability in the nature of increasing this function.

F. S. HAMMETT

**The formation of oxalic acid and ammoniacal peptonecult ures of *Aspergillus niger*.** WL. BUTKIEWITSCH. *Biochem. Z.* 129, 445-54(1922).—The ratio of oxalic acid to  $\text{NH}_3$  in cultures of *Aspergillus niger* in peptone medium approximates that corresponding to neutral  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  although there does occur a relative excess of  $\text{NH}_3$  of about 10%. Such a deviation from the theoretical in young cultures is explicable on the basis of the production of other acids than oxalic—such as intermediary products of deamination—while in the older cultures of alk. reaction it is due to the presence of free  $\text{NH}_3$ . The main  $\text{NH}_3$  formation occurs in the 1st period, during the development of the fungus mat. In the succeeding period, in which there is no growth, the  $\text{NH}_3$  formation continues at a slower rate. Under the conditions of the expts. 90% of the  $\text{NH}_3$  was formed in the first 10 days of a 40-day period. The reaction is dependent on the temp. and age of culture. The addn. of  $\text{ZnSO}_4$  (0.02%) has no influence on the utilization of peptone. F. S. H.

**The utilization of peptone as a source of carbon by *Citromyces*.** WL. BUTKIEWITSCH. *Biochem. Z.* 129, 455-63(1922).—Species of *Citromyces* show the same ability to form  $\text{NH}_3$  when the sole C and N source is the peptone of the culture as does *Aspergillus niger*. Some 75% of the total N of the peptone appears as  $\text{NH}_3$ . This property is related to production of oxalic acid as in *A. niger* and not to citric acid as stated by Mazé (Mazé and Perrier, *Ann. d'inst. Pasteur* 18, 553(1904)). In fact, the relations between development and  $\text{NH}_3$  productivity are in general the same for each plant, although the ratio  $\text{NH}_3$ -oxalic acid in *Citromyces* never reaches that value corresponding to neutral  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ .

F. S. HAMMETT

**The formation and accumulation of oxalic acid in *Citromyces* cultures on salts of organic acids.** WL. BUTKIEWITSCH. *Biochem. Z.* 129, 464-76(1922).—Both *Aspergillus niger* and species of *Citromyces* use the org. acids (e. g., citric, tartaric, succinic, quinic) as a source of C for the formation of oxalic acid, when their salts are added to the culture media. The reaction of the culture liquid is weakly alk. to litmus and acid to phenolphthalein. The development of the cultures and the accumulation of oxalic acid are better with Na salts than with  $\text{NH}_4$  salts. The acidity in the solns. contg. the former is lower. The oxalic acid production is greatly dependent on the type of acid added. *A. niger* and *Citromyces* do not react the same to the same salt. In general the former is the more active, and particularly when tartaric acid is present. The Na salt of quinic acid is a particularly favorable source of C for oxalic acid formation. F. S. H.

**The dependence of the carbohydrate content of foliage leaves on their water content.** H. S. SCHROEDER AND T. HORN. *Biochem. Z.* 130, 165-98(1922).—Comparative studies of the starch, sucrose, hexose, and  $\text{H}_2\text{O}$  content of leaves showed that the starch disappears more rapidly when the leaves are kept in the dark and allowed to wilt than when turgescence is maintained. The hexose content increases qual. independently of the  $\text{H}_2\text{O}$ . The sucrose rises with decreasing  $\text{H}_2\text{O}$  and decreases with increasing  $\text{H}_2\text{O}$  if starch is present. When starch is absent the sucrose formation is minimized. However, when the  $\text{H}_2\text{O}$  content falls the sucrose rises, perhaps at the expense of the hexoses. No law for maltose changes could be established. On the basis of these facts the opinion is expressed that starch is split to hexoses qual. independently of the  $\text{H}_2\text{O}$  content of the leaves: but when the  $\text{H}_2\text{O}$  content is lowered, sucrose is formed from the starch in amts. comparable to the  $\text{H}_2\text{O}$  decrease. An increase in starch content could not be observed. Sucrose in leaves containing starch is not a transitory reserve material built up from hexoses.

F. S. HAMMETT

**Investigation of the nitrogenous metabolism of the higher plants. II. The distribution of nitrogen in the leaves of the runner bean.** A. C. CHIBNALL. *Biochem. J.* 16, 344-62(1922); cf. C. A. 15, 2467.—The protein undergoes little, if any, change

during the life history of the leaf. Synthesis of protein from nitrates seems to pass through the amino-acid stage, while the products of protein decompn. seem to pass into urea derivs. Nitrogenous metabolism in the plant runs as follows: nitric N  $\rightarrow$  monoamino N  $\rightarrow$  protein  $\rightarrow$  "other N"  $\rightarrow$  translocated. B. H.

Coloring matter of red roses. GEOFFREY CURREY. *Proc. Roy. Soc. (London)* 93B, 194-7(1922).—The anthocyanin pigment in the petals of the red rose "George Dickson" is cyanine (a diglucoside of cyanidin), occurs in the petals as an oxonium salt in combination with a plant acid, and forms 9-10% of the dried petals. The flowers also contain a yellow glucoside sap-pigment; this pigment maybe reduced to an anthocyanin; it is not a glucoside of the flavonol myricetin, but may be a glucoside of quercetin. The petals also contain tannins derived from pyrogallol and catechol. JOSEPH S. HEPPBURN

Recent advances in science—plant physiology. WALTER STILES. *Sci. Progress* 17, 50-5(1922).—Review of recent work on irritability and movement in plants and the related chem. phenomena. JOSEPH S. HEPPBURN

Photosynthesis. I. The ratio of carbon dioxide to oxygen in carbon assimilation. S. KOSTYCHEV. *Ber. bot. Ges.* 39, 319-28(1921).—The ratio  $\text{CO}_2/\text{O}$  may depart from unity in the case of leaves exposed to artificial atms. contg. abnormally large amts. of  $\text{CO}_2$ . The assimilation of  $\text{CO}_2$  is at first in excess of the O liberated, but after a short time this relation is reversed. Eventually the ratio becomes normal. Similar results are obtained with algae. It is unlikely that under normal conditions variations in the ratio of  $\text{CO}_2$  absorbed to O liberated occur. Assimilation should be measured by the amount of  $\text{CO}_2$  absorbed, and not by the amt. of O liberated. II. Does injury stimulate photosynthesis? *Ibid* 328-33(1921).—Injury to leaves was found to be without any stimulating effect on C assimilation. A slight depression of assimilation observed was attributed to restriction of the assimilating area consequent on the method of expt. III. Does carbon assimilation take place during summer nights in subarctic regions? *Ibid* 334-8.—C. assimilation generally ceases at sunset, even although the twilight in latitude  $60^\circ$  N. furnishes sufficient light for the process to go on. This may be due to the effect of the fall in temp. in closing the stomata. A certain amt. of C assimilation was found to take place after sunset in the case of coniferous trees. IV. Carbon dioxide assimilation by Leguminosae. *Ibid* 40, 112-9(1922).—In gasometric expts. with the concn. of  $\text{CO}_2$  above that in the atm.,  $\text{CO}_2$  assimilation by Leguminosae is markedly greater than by other plants. The presence of nitrates in the soil increases the assimilation; the effect is, however, not shown in short period expts. Alder species although possessing nodules on their roots do not resemble the Leguminosae in their energy of  $\text{CO}_2$  assimilation. J. C. S.

Effect of transpiration on the disappearance of starch from leaves. HANS MOLISCH. *Ber. bot. Ges.* 39, 339-44(1921).—The disappearance of starch from leaves placed in darkness is more rapid in a dry than in a moist atm. Leaves kept in a moist atm., although little of their starch had been altered, contained more reducing sugars than leaves kept in a dry atm. which had lost all their starch. It is supposed that substances other than sugars, probably dextrans and similar substances, are formed from the decompn. of starch. It is not necessary to assume translocation, as the starch reaction disappears even in stalkless leaves. J. C. S.

Energy exchange in carbon assimilation by green cells. C. MÜLLER AND O. WARBURG. *Ber. physik. techn. Reichsanst.* 1920.—The utilization of energy in the assimilation of C by *Chlorella vulgaris* in a nutrient soln. satd. with 4% of  $\text{CO}_2$  was studied for different wave lengths. The percentage utilization of energy in different parts of the spectrum was as follows: red (600-710 $\mu$ ) 14%; yel owish red (600-650 $\mu$ ) 20%; orange (570-610 $\mu$ ) 23%; yellow (550-590 $\mu$ ) 21%; green (510-550 $\mu$ ) 15%; blue (445-500 $\mu$ ) 13%. J. C. S.

**Action of coal gas on plants.** C. WEHMER. *Biedermann's Zentr.* 50, 425-8(1921).—W. has examd. the effect of coal gas on 3 to 7 year old trees grown in pots. In winter, the trees are scarcely affected, but in spring they wither and gradually die. Fir and elm trees are especially sensitive, then come maple, while lime trees are least sensitive. The trees survive the action of coal gas in the autumn. From these expts. and further expts. on twigs immersed in water satd. with coal gas it is concluded that the harmful effect of coal gas is most pronounced when the root system commences its activity after winter, and is not due to action on the foliage. The harmful effect is due to certain constituents in the gas, particularly those which impart an odor to the gas. HCN is particularly harmful. J. C. S.

**Variations in the chemical composition of Fucaceae.** L. LAPICQUE AND L. EMERIQUE. *Compt. rend. soc. biol.* 85, 172-5(1921).—The compn. of Laminaræe shows an annual periodicity, the carbohydrate increasing in the summer and the ash constituents decreasing. *Fucus serratus* is similar, except that in June it contains a large quantity of mineral matter. *F. vesiculosus* exhibits a min. of sol. ash constituents in June. *F. platycarpus* has a higher ash content. The analytical results are tabulated. J. C. S.

**Photosynthesis and the electronic theory.** II. H. H. DIXON AND N. G. BALL. *Sci. Proc. Roy. Dubl. Soc.* 16, 435-41(1922); cf. Dixon and Poole (*C. A.* 14, 2011).—In continuation of previous work, the photoelec. properties of chlorophyll were investigated. The electronic theory of sensitization is supported by expts. in which sensitized photographic plates were affected by light at a temp. of  $-185^{\circ}$ , chem. action being thereby precluded. By using collodion films, it was shown that sensitization by chlorophyll is also effective even at the temp. of liquid air. Since only light of visible wave lengths is absorbed by chlorophyll, and since earlier expts. have shown that electrons are not expelled from chlorophyll, it follows that the light absorbed is wholly used in the displacement of electrons within the mol., thereby making some at. group or groups reactive. In photosynthesis, these groups may react with  $\text{CO}_2$  and water, according to the scheme chlorophyll-*a* +  $\text{CO}_2$  = chlorophyll-*b* +  $\text{CH}_2\text{O}$  and chlorophyll-*b* +  $\text{H}_2\text{O}$  = chlorophyll-*a* +  $\text{O}_2$ . It is assumed that these reactions only take place during illumination and depend on its intensity. The velocity of the first reaction would only increase with intensity of illumination so long as  $\text{CO}_2$  is in excess, while the velocity of the second reaction would only be indirectly influenced by this factor. J. C. S.

**Pests and diseases of barley and malt.** II. Fungi and the fungus diseases of barley. F. A. MASON. *J. Inst. Brewing* 28, 325-53(1922).—Among the common diseases caused by fungi in barley only smuts, rusts, and to some extent stripe diseases are at present subject to control. In the near future it is possible that a method of treatment involving the use of hot air will be found applicable to a large number of diseases of cereals. The 2 methods of treatment at present in use to control smuts are treatment by hot water and treatment by solns. of chem. substances of known fungicidal properties, e. g., Cu sulfate and formalin. While the hot water treatment may be used for organisms inside the seed, the chem. method can only be used for the destruction of spores outside the seed. J. S. C. I.

**The migration of constituents in grafted plants.** H. COLIN. *Bull. officiel direction recherches sci. ind. inventions* No. 31, 313-8(1922).—As far as is known at present, except in the case of atropine which can pass in very small quantities from belladonna to tomato, a substance characteristic of one plant does not pass to another on which it is grafted or which is grafted on to it. In the case of *Helianthus annuus* and *H. tuberosus*, careful analyses were made of the various parts of the leaves, stems, roots, and seed, before and after grafting, but no inulin could be found in *H. annuus*. C. concludes that if there is any transfer of inulin to *H. annuus*, it is immediately hydrolyzed to reducing sugars. A. P.-C.

**The role of chemistry in the selection and improvement of plants.** JACQUES DE VILMORIN. *Chimie et industrie* 7, 884-9(1922).—V. makes brief mention of Mendel's work on hybridization and heredity in plants, and shows the importance of chem. control in the choice of seed plants in the cultivation of sugar beets, mangolds, Jerusalem artichokes, chicory, wheat, potatoes, and alkaloid-bearing plants. A. P.-C.

**Semipermeability of cell walls.** H. SCHROEDER. *Biol. Zentr.* 42, 172-88(1922).—This work is a continuation of Moeller's study (*C. A.* 16, 1107) on the formation of *rhythmic bands* similar to *Liesegang's rings* on the surface of grain kernels by means of diffusion of  $\text{AgNO}_3$  soln. and pptn. with suitable salts. S. shows that the presence of alc. in the  $\text{AgNO}_3$  soln. hinders the velocity of the migration of the  $\text{Ag}^+$  in the cellulose walls. This is ascribed to the diminution of colloidal swelling through the action of the alc. The general postulate is that cellulose walls of plants are permeable to crystalloids of small mol. size depending upon the process of aq. swelling which accompanies the passage of the ions. Towards colloids (large mol. complexes) the cellulose walls may behave as a sieve, similar to the behavior of a gelatin gel. W. A. P.

**Agglutination of algae, yeasts and flagelates. The mechanism of cell reactions.** STEFANIE LICHTENSTEIN. *Sitzb. preuss. Akad. Wiss.* 1922, 127-34; cf. *C. A.* 9, 1189.—An extension of L.'s previous work on yeasts to algae and flagelates. Fairly accurate grouping of various algae (*Chlorella protothecoides*, *Protococcales*, and *Stichococcus*) and of flagelates (*Euglena gracilis*, *Asiasia ocellata*, and *Polytoma*) was effected by means of the agglutinin reaction with immune rabbit sera. By using cultures of *Euglena* both free of and contg. chlorophyll it was shown that this pigment has no relation to the agglutinin reaction. It appears that only the truly protoplasmic or nuclear substances are involved in cell specificity. W. A. PERLZWEIG

**Influence of selenium on vegetable growth in the presence and in the absence of radioactivity.** J. STOKLASA. *Compt. rend.* 174, 1256-8(1922). Plants of *Hordeum distichum*, *Zea mays*, *Polygonum fagopyrum*, *Vicia faba*, *Soja hispida*, and *Lupinus angustifolius* were placed in the most favorable conditions of water culture and their growth and production of chlorophyll observed upon the addition of  $\text{Na}_2\text{SeO}_3$  or  $\text{Na}_2\text{SeO}_4$  to the nutritive liquid, with and without the action of Ra. The concns. used were  $5.1 \cdot 10^{-6}$ ,  $10^{-5}$ ,  $5.1 \cdot 10^{-4}$ ,  $5.1 \cdot 10^{-3}$ ,  $5.1 \cdot 10^{-2}$ , and  $10^{-2}$  of a gram atom of Se per liter of nutritive liquid, the latter being renewed every 15 days.  $\text{Na}_2\text{SeO}_3$  was always more toxic than  $\text{Na}_2\text{SeO}_4$ . The latter in concns. of  $5.1 \cdot 10^{-6}$  to  $10^{-5}$  had a stimulating effect.  $\text{Na}_2\text{SeO}_3$  in a concn. of  $10^{-2}$  gradually killed the corn, buckwheat, bean, and lupine plants. To exptl. pots contg. 3500 cc. of the nutritive liquid with  $5.1 \cdot 10^{-4}$  Se, as  $\text{Na}_2\text{SeO}_3$ , was added 0.0000056 mg. of Ra per plant per day and the growth observed for 84 to 112 days. The growths with and without the emanation were barley 50.03 and 22.09 g., corn 114.6 and 66.2, buckwheat 5.06 and 0.36, lupine 21.39 and 5.32, vetch 52.9 and 22.17, resp. The barley, lupine and vetch grew 99 days, the buckwheat 84, and the corn 112.  $\text{SeO}_2$  in concns. of 1 in 100,000 killed all of the exposed plants in 1 to 2 hrs., whereas with  $\text{SO}_2$  they were but slightly attacked. In the light  $\text{SeO}_2$  in concns. of 1 to 200,000 is less active than in the dark. The living cell in the light and particularly under Ra emanations possesses the power to reduce and render non-toxic the combinations of Se. L. W. RIGGS

**Vegetable growth in media poor in oxygen.** L. MAQUENNE AND E. DEMOUSSY. *Compt. rend.* 174, 1387-92(1922); cf. *C. A.* 15, 4018.—Small seeds immersed in an aseptic medium germinate and grow to plants of normal appearance except for the small size of the leaves. They do not, however, have an assimilative capacity comparable to that of a normal plant. Expts. with peas and wheat for 30 and 25 days, resp., showed that the dry matter of the plants was practically equal to that of the seed, but the dry matter of radish after 14 days, and of rape after 24 days was, resp., 1.6 and 7.4 times

the wt. of the seed. This proves that the small amt. of O contained in aerated water not only suffices for the germination of small grains but maintains the respiration of terrestrial immersed plants as well as aquatic species. If a young plant grown from an immersed seed is immersed in water satd. with air and charged with  $\text{CO}_2$  and exposed to sunlight, O is given off in abundance from the leaves and also from the roots and certain nodes. Leaves of certain species are able to conserve their vitality in the sunlight in the absence of air for periods exceeding that of their natural lives. Thus leaves of *aucuba*, after being kept a year, decompd.  $\text{CO}_2$  readily.

L. W. RIGGS

**Role of manganese in plants.** J. S. MCHARGUE. *J. Am. Chem. Soc.* **44**, 1592-8 (1922).—Various plants (wheat, peas, radish, lettuce, tomato, spinach, carrot, onion, beans, cabbage, oats, clover) were grown in nutrient solns. with and without Mn and in Mn-free sand to which were added mineral plant nutrient constituents and, in half of the sand cultures, Mn in the form of the carbonate. Those grown in a medium containing no Mn made a normal growth for 6-8 weeks but thereafter developed a chlorotic condition and failed to make further growth of any consequence. The normal condition during the first few weeks of growth is accounted for by assuming that the Mn which the seed contained was sufficient to maintain a normal metabolic process during this part of the plant's growth, and that the chlorotic condition was a result of the lack of a further supply of available Mn.

C. A. R.

**Chemical constituents of green plants. XVII. Occurrence of lactic acid in blackberry leaves (*Rubus fruticosus*).** H. FRANZEN AND E. KRYSSNER. *Z. physiol. Chem.* **116**, 166-8 (1921); cf. *C. A.* **16**, 2350.—Lactic acid was identified by prep. its Zn salt and the benzylidene deriv. of its hydrazide.

R. L. STEHLÉ

**The alkaloid taxine from the yew tree (*Taxus baccata*).** I. E. WINTERSTEIN AND D. LATIMERS. *Z. physiol. Chem.* **117**, 240-83 (1921).—The alkaloid is present in the dried needles to the extent of 0.7-1.4%. Its empirical formula is  $\text{C}_{21}\text{H}_{34}\text{O}_{10}\text{N}$  (similar to that of amorphous veratrine). Taxine and its derivs. are amorphous. Hydrolysis with dil. acids gives cinnamic and acetic acids. It adds 2 molecules of H and with  $\text{Ac}_2\text{O}$  yields a deriv. containing 3 or 4 Ac groups. The Br addn. product is insol. On oxidation with  $\text{KMnO}_4$  taxine gives  $\text{BzOH}$ ,  $\text{AcOH}$  and oxalic acid. It is a heart poison. A fatal dose causes convulsions, fall of blood pressure and stopping of the heart if diastole. For rabbits the lethal dose is 0.004-0.005 g. intravenously and 0.024 g. by mouth per kg. body wt.

R. L. STEHLÉ

**Comparative plant chemistry. I. *Lythrum salicaria*.** L. JULIUS ZELLNER. *Monatsh.* **42**, 453-8 (1922).—The examn. of the stalks and leaves of *Lythrum salicaria*, L. gave the following results: Petr. ether-sol. (fats, chlorophyll, phytosterol, carotin, waxes), 3.69%;  $\text{Et}_2\text{O}$ -sol. (tannins), 1.73; 95% alc. (sugars, phlobaphen, tannins, basic compds.) 16.36; phlobaphene, 1.86; tannins, 5.65; glucose, 4.55;  $\text{H}_2\text{O}$ -sol. (plant slime, org. acids, mineral matters, etc.), 31.27; mineral matter, 5.18; plant slime, 8.08; free acid, 3.55; total N, 2.15; total ash, 7.62. The ash contains relatively large amts. of  $\text{CaSO}_4$ . **III. *Campanula rotundifolia*.** L. FRIEDRICH SPRINGER. *Ibid* **43**, 13-20 (1922).—Petr. ether ext., 6.09%;  $\text{Et}_2\text{O}$ -sol. (resins), 2.01; alc.-sol., 17.39; tannins, 6.35; sugars, 2.10;  $\text{H}_2\text{O}$ -sol., 24.87; carbohydrates pptd. by alc., 2.62; free acids, 1.19; sol. N, 0.66; ash in extractives, 3.46; pentosans, 12.89; crude fiber, 35.50; total N, 2.80; total ash, 4.428. The  $\text{Et}_2\text{O}$ -sol. part of the alc. ext. is a cholesterol-like compound,  $\text{C}_{28}\text{H}_{48}\text{O}_6$ , m.  $214-5^\circ$ , which gave an oxidation product, m.  $232^\circ$ .

C. J. WESR

**Chemistry of higher fungi. XV. Chemical relations existing between the higher parasitic fungi and their substrata.** RUDOLF HASENÖHL AND JULIUS ZELLNER. *Monatsh.* **43**, 21-41 (1922); cf. *C. A.* **4**, 3241.—Analytical results are reported for the compn. of various fungi and their substrates. *Polyporus ignarius*, *P. hirsutus*, *Russula alutacea*, and *Hypholoma fasciculare* are reported in detail. The original should be consulted for the data.

C. J. WESR

**Toxic effect of illuminating gas upon plants.** J. H. PRIESTLY. *Gas J.* 158, 443 (1922).—The deleterious effect of coal gas in the atm. upon growing plants, especially upon etiolated shoots or roots, can be traced to the presence of the gaseous unsatd. hydrocarbons such as  $C_2H_4$ . If etiolated shoots are placed in an atm. contaminated with coal gas or pure  $C_2H_4$ , they cease to grow in length and expand in girth instead. There is a change in internal structure, notably the disappearance of the functional primary endodermis, which can be attributed to the displacement by the unsatd. hydrocarbons of the unsatd. fatty acids which normally accumulate upon the walls of the developing endodermis and give it its characteristic properties. The normal leafy stem growing in the light does not develop such endodermis and is relatively insensitive to the presence of these gaseous unsatd. hydrocarbons. The effect may be produced by concns. of 1 part of  $C_2H_4$  in 1 million. This is of interest in the protection of trees from damage by gas escaping around the roots.

J. L. WILEY

**The determination and distribution of chlorine in plants.** J. JUNG. *Sitzb. Akad. Wiss., Wien* 129, 297-340(1920).—Several hundred microchem. examns. of plants for Cl are reported. Two reagents were developed for detecting Cl: (a)  $AcOTl$  0.5 g., glycerol 2 g., water 7.5 g.; (b)  $AgNO_3$  0.1 g., 10% ammonia 9.9 g. Representatives of all branches of the plant kingdom, from the slime-molds to flowering plants, and various organs of the plants were examd. Cl is found in plants only as chloride. Only a few plants lack Cl altogether; among the latter are the conifers. Some families are characterized by high, others by low, Cl content. The Cl usually increases in amt. from the roots to the leaves; it is most abundant in succulent, parenchymatous tissues, apparently being dissolved in the cell sap. It is usually scarce in the epidermis, bundles, hairs, flower parts, pollen, woody tissue, and chlorophyllous mesophyl, and abundant in fleshy roots and rhizomes. Plants that grow in rich, moist soil and in the sea are richer in Cl than those growing in sandy soil, heaths, and fresh water. Mosses, ferns, epiphytes, parasites, and saprophytes contain little or no Cl.

J. J. WILLAMAN

**Studies on anthochlor.** G. KLEIN. *Sitzb. Akad. Wiss., Wien* 129, 341-04(1920).—The yellow pigment from 300 species of flowers was examd.; of these, 80 contained anthochlor, the rest mostly carotin. Its occasional simultaneous occurrence with carotin, flavone, and anthocyan was proved, and its close relation to anthocyan in the case of closely related plants was established. It is not a single pigment, but a group of closely related ones. It is a glucoside. Its reactions with concd. mineral acids, alkalies, metallic salts, and reducing agents are discussed.

J. J. WILLAMAN

## E—NUTRITION

PHILIP B. HAWK

## NORMAL

**The nutritive value of new and old maize.** J. J. NITZESCU. *Arch. ges. Physiol.* (Pflüger's) 172, 275-317(1918); *Expt. Sta. Record* 46, 187.—Digestion and N balance trials with 6 hens, 6 cocks, and 6 white rats are reported. Half of each group were fed newly harvested corn and the other half corn that had been stored from 1 to 4 years. The expts. with chickens lasted 40 days and were divided into 4-day collection periods. The rat expt. consisted of ten 3-day periods. The animals were in sep. cages, and the data for each individual in each period are tabulated in great detail. The starch content of the corn meal and the excreta was detd. by hydrolysis with HCl and titration against Fehling's soln. For the entire period of each expt. the av. coeffs. of digestibility of the new and the old corn, resp., were as follows: Hens 92 and 96, cocks 89.6 and 95.2, and rats 92.3 and 95.4. In each of the 30 periods the coeffs. for the old corn were higher than those of the new. In each expt., although not in every collection period, more N was stored in the body by the animals fed the old corn than those fed the

new. In the case of rats fed the new corn the av. N balance was negative. To distinguish between the urinary, and fecal N of the fowls, the excrement was extd. with LiOH and filtered, sep. N detns. being made of the filtrate and the residue. All the uric acid N passed into the filtrate as Li urate, and the uric acid was recovered by pptn. with  $\text{H}_2\text{SO}_4$ . The ratio of uric acid N to total N of the filtrate averaged for the new and old corn, resp., 0.608 and 0.655 in the case of the hens and 0.649 and 0.672 in the case of the cocks. Since these ratios were approx. equal to the ratio of uric acid N to urinary N in expts. with a hen and a cock operated on to permit sep. collection of feces and urine, and since the uric acid excreted per day per kg. of live wt. was about the same in the fowls with normal and those with preternatural anuses, it is concluded that the N of the LiOH ext. of the excreta can be considered the urinary N and the N of the residue the fecal N. On this assumption there seems to be no consistent difference between old and new corn in the digestibility of its N. H. G.

**The phosphorus and calcium metabolism of the horse when fed oats exclusively.** A. SCHEUNERT. *Arch. wiss. prakt. Tierheilk.* 44, Sup. 188-97(1918); *Expt. Sta. Record* 44, 672.—After a 9-day preliminary period on a ration of whole oats alone (11 lbs. per day), a healthy horse was continued on the same ration through a 10-day metabolism trial during which he was exercised frequently. The av. intake of  $\text{P}_2\text{O}_5$  was 44.05 g. per day, and of this 1.05 g. was stored in the body. The daily CaO intake (including traces in the water) was 5.7 g. and the outgo 14.1 g. The amt. of Ca appearing in the feces was irregular from day to day, but there was a fairly steady decrease in the urinary Ca as the expt. progressed. At the end of the test the horse showed loss of appetite, decline in strength, and a tendency to lameness. H. G.

**Dietetic experiments with frogs.** A. HARDEN AND S. S. ZILVA. *Biochem. J.* 14, 283-6(1920); *Physiol. Abstracts* 5, 186.—Water-sol. B is necessary for the continued life of the adult frog. Expts. with tadpoles were unsatisfactory, and are to be repeated. H. G.

**Digestibility of germinated beans.** D. M. ADKINS. *Biochem. J.* 14, 637-41 (1920); *Expt. Sta. Record* 44, 761.—A study *in vitro* of the digestibility of the proteins of 3 varieties of beans, ungerminated and germinated, is reported. In a series of 29 expts. the increase in N digestibility of the germinated over the ungerminated beans varied from 15.3% when the beans were germinated rapidly to 4.3% on slow germination. Drying the germinated beans even partially again decreased their digestibility, the increase in N digestibility of dried germinated beans over ungerminated varying from 7.8 to 1.2%, according to the rapidity with which drying occurred. H. G.

**Anorexia in pigeons nourished on polished rice and the role of vitamins in nutrition.** A. LUMIÈRE. *Bull. acad. med.* [3] 83, 310-13(1920); *Expt. Sta. Record* 45, 867-8; cf. *C. A.* 14, 2814.—L. has attempted to explain the anorexia of pigeons fed on polished rice by a comparison of the changes taking place in the crops of pigeons forcibly fed on unpolished and polished rice, resp. It is possible forcibly to feed from 50 to 60 g. of unpolished rice daily for several weeks, while in similar expts. with polished rice, the rice, even when fed in small amts., 30 g. daily, accumulated in the crop with gradual distension until intolerance for the food led to regurgitation. On opening the crop several hours after a large amt. of rice had been forcibly fed, the unpolished grains were found to be abundantly impregnated with secretions, while the polished rice was much drier. The administration of a few cg. of ext. of brewery yeast to pigeons forcibly fed with polished rice to the point of intolerance led to abundant secretions from the glands of the crop and a rapid evacuation of the contents of the digestive tract. Pigeons submitted to a régime of polished rice die, therefore, of inanition because they lose their appetite. This anorexia seems due principally to the insufficiency of the functioning of the glands of internal secretion, whose normal activity appears due to



the presence in foods of substances which excite it. The vitamins intervene to fill the excito-secretory role, as well as to maintain the tonus of the organs of digestion. H. G.

Some recent contributions to the literature of vitamins. II, III. L. M. POTTER. *Intern. J. Pub. Health* 1, 240-7; 367-71 (1920); *Expt. Sta. Record* 46, 257.—The first of these two papers reviews the literature on beriberi, including a discussion of recent papers in which other theories than vitamin deficiency are presented in explanation of the cause of beriberi. It is shown, however, that the other etiological factors suggested appear to be rather predisposing than causative. A list of 41 references to the literature is appended. In the second paper the fat-sol. vitamin is discussed, particularly from the viewpoint of a connection between lack of this vitamin and rickets. A list of 28 references to the literature is appended. Cf. C. A. 15, 2904.

H. G.

The water-soluble B vitamin content of certain vegetables. G. C. DUNHAM. *Military Surg.* 48, No. 2, 223-34 (1921); *Expt. Sta. Record* 45, 765.—The vitamin B content of various vegetables was detd. as follows: Albino rats from 4 to 5 weeks old were fed *ad libitum*, a basal ration of casein 20, starch 61, butter fat 15, and salt mixt. 4% until growth had ceased and in some cases a slight decrease in wt. had occurred. The air-dried and pulverized vegetable to be tested was then fed in decreasing amts. apart from the daily ration until the wt. became const. at some point between 75 and 100 g., when the rat was 100 to 130 days old. The feeding of the ration thus adjusted to maintain a const. wt. was continued for 30 days, during which time the wt. should remain const. with an allowable variation of  $\pm 4\%$ . At the end of this period 500 mg. of dried yeast was added daily to the diet in place of the substance tested. Immediate restoration of growth indicated that the lack of growth was due to insufficiency of vitamin B. As tested thus the daily dosage in mg. of the vegetable food products examd. was as follows: baker's yeast 50, potato raw 65, potato boiled with skins 95, potato boiled without skins 125, potato baked 100, spinach boiled 85, cabbage raw 70, cabbage boiled 95, carrots raw 70, carrots boiled 105, turnips boiled 105, peas canned uncooked 115, and peas canned with boiling 125 mg. A comparison of the raw and cooked foods showed that some of the vitamin is extd. by the cooking water and lost when this water is discarded, as was the case in the expts. reported.

H. G.

Strictly exogenous substances necessary to the animal organism. A. CAMPUS. *Riv. viol.* 3, No. 4, 497-513 (1921); *Expt. Sta. Record* 46, 259.—The substances which are required by the animal organism for growth and maintenance are classified as strictly exogenous and facultatively exogenous, the first group including those indispensable substances which can not be synthesized by the organism, and the second equally indispensable substances which need not be introduced into the organism as such but can be synthesized from simpler materials. The recent literature is reviewed on the strictly exogenous food materials, including the elements Cl, Ca, Fe, and P; the amino acids cystine, tryptophan and lysine, and arginine and histidine; cholesterol; and the vitamins.

H. G.

The bearing of recent research on problems of nutrition. D. G. O'BRIEN: *Scot. J. Agr.* 4, 140-8 (1921); *Expt. Sta. Record* 45, 373.—O. discusses the importance of vitamins in animal feeding, and reports briefly a feeding expt. at the West of Scotland Agr. College in which 48 pigs were fed for 19 weeks on a ration of corn, bran, and middlings, supplemented by whey. An increase in the whey consumption toward the end of the expt. caused an improvement in the rate of growth, but no such improvement was made when the whey was temporarily increased at an early stage, although an increase in the amt. of grain at this stage increased the growth. Since the pigs had been on a milk diet prior to the expt., it is thought that they had an ample reserve of vitamin A and thus derived no benefit from the added vitamins provided by the whey. Later, when the reserve was depleted, growth was promoted by the feeding of more vitamins. H. G.

**The influence of illumination on the metabolism of carbohydrates.** LUDWIG PRINCUSSEN. *Klin. Wochschr.* 1, 174(1922).—A general illumination, following an injection of adrenaline, gives rise to an increase in the blood sugar concn. A decrease in the blood sugar concn. is obtained if eosin is given previous to illumination. Adrenaline plus eosin plus light produces an effect that is the resultant of the 2 activities taken separately, the blood sugar concn. being only slightly increased. The rate of oxidation of carbohydrates and allied substances is increased, *in vivo*, when the eosin-treated subject is illuminated. This is proved by the fact that when diabetics are so treated, the blood sugar concn. decreases, the excretion of sugar into the urine decreases or disappears entirely and the acetone bodies also largely disappear from the urine. Hypophyseal diabetics, with a large vol. output of urine, are entirely refractory to illumination. The blood sugar concn. is not changed by illumination with X-rays. MILTON HANKE

**Law of the minimum in the science of nutrition.** KARL THOMAS. *Z. angew. Chem.* 34, Aufsatzteil, 601-6(1921).—A discussion of the factors which det. the value of a food as a nutrient, *i. e.*, its content of ash-forming elements, proteins and their constituent amino acids, carbohydrate, fat, and vitamins. Stress is placed on the high value of milk as a food. JOSEPH S. HEPBURN

**Coconut meal, gluten feed, peanut meal and soy bean meal as protein supplements for dairy cows.** A. C. McCANDLISH AND E. WEAVER. *J. Dairy Sci.* 5, 27-38(1922).—Old process linseed oil meal, peanut meal, soy bean meal and gluten were used as protein supplements in the diets of dairy cows. Little difference in value was observed with the possible exception of coconut meal which may have a higher value than the other feeds studied, despite its lower content of total protein. In palatability the feeds ranked as follows: linseed oil meal, soy bean meal, gluten feed, peanut meal and coconut meal.

H. B. LEWIS

**The modern science of nutrition.** M. RUBNER. *Ber.* 55A, 57-80(1922).—Review of recent work and theories.

H. B. LEWIS

**Improved method for the preparation of vitamin-activated fullers earth.** A. SEIDELL. *U. S. Pub. Health Repts.* 37, 801-3(1922).—The earlier method of Seidell for the prepn. of vitamin-activated fullers earth, which involved slow filtration of autolyzed yeast, has been improved by the substitution of heating at 90° with an equal vol. of tap H<sub>2</sub>O for 5 min. in place of autolysis. The mixt. is cooled to 50° and the coagulated protein removed by filtration (or better by centrifugation). Samples of activated solid prepd. from this filtrate contained less N (1.15% instead of 2%) than those prepd. by the original method and no adenine. The content of antineuritic vitamin (as tested by feeding expts. with pigeons) was twice as great as that of products made by the original method.

H. B. LEWIS

**The basal metabolism of infants fed on dry milk powder.** F. B. TALBOT AND M. E. MORIARTY. *U. S. Pub. Health Repts.* 37, 116-23(1922).—The basal metabolism of infants (5 male, 7 female) maintained on dry whole milk powder or reconstructed milk made from a basis of skim-milk powder was studied. The metabolism of the male infants tended to fall within standard variations, that of female infants fell more than 10% above the normal av. but was not outside of the extreme of normal variations. This tendency of the basal metabolism of infants fed on dry milk powder to be slightly higher than that of normal infants may have been due to the relatively higher protein level of the diet, but the variations from the av. were not sufficiently marked to warrant striking conclusions.

H. B. LEWIS

**The conditions under which vitamin A functions.** H. v. EULER. *Arch. Kemi. Mineral. Geol.* 8, No. 19, 1-10(1922); cf. *C. A.* 16, 1805.—Mice 25 days old were fed a basal diet of the following % compn.: casein 20, rice starch 50, arachis oil 12, yeast ext. 6, orange juice 6, salt mixt. (Drummond's) 6. Vitamin A was supplied by carrots.

The dried residue from a benzene ext. of carrots (which had been pptd. with alc.) had slight growth-promoting properties. It contained most of the phosphatides. 0.2 g. per 10 g. basal diet gave better results than 0.1 g. Butter produced from Aug. to Oct. was dissolved in benzene, filtered, dried and reduced to  $\frac{1}{4}$  the original vol.; 50% alc. was then added, the resulting ppt. was filtered off and the solvent completely evapd. The addn. of 0.1 g. of the resulting butter residue to 10 g. basal diet gave better growth than the carrot prepn. but it was still subnormal; 0.4 g. showed a still greater improvement in growth. 0.1 g. carrot prepn. + 0.1 g. butter prepn. per 10 g. basal diet permitted growth which still more closely approached normal. These expts. show that several different components of vitamin A are concerned in growth activity. Other expts. indicated that the discontinuous addn. of vitamin B to the basal diet significantly increased the growth-promoting activity of A. The effect of B on the activation of the ymase system of yeast was also studied. 0.5 g. of thoroughly washed and dried yeast freed from B + 50 cc. 4% sucrose soln. yielded 4.6 cc.  $\text{CO}_2$  in 6 hrs.; the addn. of 5 and 10 cc. milk increased the  $\text{CO}_2$  to 6.5 and 8.0 cc., resp. 0.25 g. of the same yeast prepn. yielded 21 cc.  $\text{CO}_2$  from a 5% pyroracemic acid soln. in 2 hrs. With milk heated to  $80^\circ$  only about  $\frac{1}{2}$  the amt. of  $\text{CO}_2$  was obtained.

CHAS. H. RICHARDSON

## ABNORMAL

Alcoholic extracts of brewers' yeast in avian polyneuritis. H. PENAU AND H. SIMONNET. *Compt. rend. soc. biol.* 85, 198-200(1921); *Expt. Sta. Record* 46, 569.—This is a brief summary of the results of detns. of the minimal protective doses of alc. extracts of dried yeast for pigeons on the basal vitamin-free ration previously described (*C. A.* 15, 2470). One sample of yeast was subjected to 3 successive extns. for 20 hrs. each with alc. at from  $80$  to  $85^\circ$  and another sample to 7 extns. of 48 hrs. each with alc. at from  $15$  to  $20^\circ$ . While the exts. prepd. at the higher temps. proved slightly superior to the cold, the difference was not marked. Daily doses of 0.1 g. of the dried ext. proved sufficient to keep the exptl. pigeons in good health. The protection conferred by the ext. did not continue for more than 5 to 10 days after the ext. had been omitted from the diet, no matter how long the expt. had been continuing, thus showing no appreciable storage of vitamin B in the body. The wt. curves showed that for a food intake of from 70 to 100 g. the amt. of ext. required for a 300-g. pigeon varied from 0.07 to 0.1 g., while for a 500-g. pigeon the amt. had to be increased to 0.15 g. Variations in the wt. curves followed those of the ext. administered with a lag of from 3 to 5 days. The fractional extn. yielded products of decreasing activity, but some activity remained even to the seventh extn. The yeast remaining also showed some activity. No loss in activity resulted from preservation of the alc. extracts in closed flasks in a desiccator for a period of at least six months.

H. G.

Acid intoxication due to food poisoning. THEODORE LE BOUTILLIER. *Arch. Pediatrics* 39, 308-13(1922).—The underlying causes of most cases of acid intoxication or recurrent vomiting is a food intolerance; the condition is cured by use of protein inoculation tests to detect the offending food, and exclusion of that food from the diet. Many attacks of acute or chronic indigestion and many cases of malnutrition are also due to food intolerance. An attempt should be made to overcome the intolerance by careful administration of the offending foods in small quantities at decreasing intervals. These conclusions are based on 12 cases, in which the children ranged in age from 20 months to 9 years. A positive reaction for carrot protein was given by 8 cases; hence this vegetable should be given with caution, if at all, to children. A positive reaction was given in 3 cases each by bacon, prune, asparagus, squash and cocoa, in 2 cases each by beef, barley, rice, oat, pea, string bean, tomato, pineapple and egg, and in 1 case each by banana, peach, fig, strawberry, peanut, celery, corn and lima bean. The tolerance for an offend-

ing food apparently was lessened when a moderate to large amt. of fat was included in the diet.

JOSEPH S. HEPBURN  
 EMERSON, WM. R. P.: Nutrition and Growth in Children. New York: D. Appleton & Co. 341 pp. \$2.50. Reviewed in *Am. J. Public Health* 12, 624(1922) and *Am. Food J.* 17, 25(1922).

KLIMMER, M.: The Feeding of Productive Farm Animals. 3rd Ed. revized and enlarged. Berlin: Paul Parey. 240 pp.

## F—PHYSIOLOGY

ALFRED N. RICHARDS

Gastric juice. II. Action and properties of gastric lipase. MAKI TAKATA. *Tohoku J. Exptl. Med.* 2, 209-57(1921).—The gastric juice used was obtained from the Pavlov pouches of 12 dogs. Various simple esters, fats and lecithins were used as substrates. Gastric lipase digests fats under circumstances resembling those of ptyalin. The mutual relation of the lipases in the gastric and the pancreatic juice is like that of the amylases in the saliva and the pancreatic juice. A fatty meal may reduce the acidity of the gastric juice and make its lipase more active.

H. V. ATKINSON

Physiological effects of insulin. F. G. BANTING, C. H. BEST, J. B. COLLIP, J. HEPBURN, J. J. R. MACLEOD AND E. C. NOBLE. *Trans. Roy. Soc. Can.* 16, Sect. V 1-18(1922); cf. *C. A.* 16, 1980, 2905. III. Preparation of pancreatic extracts, containing insulin. (F. G. B., C. H. B., J. B. C., J. J. R. M.) Early exts. were made by ligaturing the pancreatic ducts of the dog and waiting 7 to 10 weeks for degeneration of acinous tissue. The remnant, contg. healthy insular tissue, was removed and macerated in ice-cold Ringer soln.; it gave an ext. which markedly reduced blood sugar and sugar excretion in diabetic dogs. Similar exts. were obtained from fetal calf pancreas of under 4 month's development. Later, 95% alc. was substituted for Ringer soln., the alc. ext. evapd. to dryness in warm air current, and the resin-like residue dissolved in saline soln. This soln. had the same effect on diabetic dogs; it did not contain trypsin; the active principle was destroyed by boiling; it was insol. in 95% alc. and daily injections kept a totally depancreatized dog alive 70 days. The following procedure has been evolved: Add freshly minced pancreas in equal amt. to a small vol. of 95% alc. Allow to stand some hrs. occasionally shaking, then strain through cheese cloth and filter. Treat the filtrate with 2 vols. 95% alc. which removes most of the protein. Filter, and conc. filtrate to small bulk by distg. *in vacuo* at 18-30°. Ext. with Et<sub>2</sub>O twice, return the aq. soln. to a vacuum still, and conc. to a paste. Add 80% alc. and centrifuge. Of 4 distinct layers, the uppermost is alc. contg. the active principle, next a flocculent layer of protein, then an aq. layer satd. with salt, then salt crystals. Deliver the alc. layer into several vols. 95% or better abs. alc. The active principle is pptd. along with adherent substances. After some hrs. filter through a Buchner funnel, dissolve in H<sub>2</sub>O, and conc. in the vacuum still. Pass through a Berkfeld filter. After tests for sterility the product is ready for clinical use. It contains only min. protein, no lipid, is practically salt-free and can readily be made isotonic, is almost free from alc.-sol. constituents, and can be administered subcutaneously without fear of any local reaction. IV. Effect of insulin on normal rabbits and on rabbits rendered hyperglucemic in various ways. (F. G. B., C. H. B., J. B. C., J. J. R. M., E. C. N.). A marked fall of blood sugar occurs in normal rabbits. It is so const. that it can be used for purposes of physiol. assay (one rabbit dose is the amt. of insulin given subcutaneously which lowers the blood sugar by 50% in 1-3 hrs.). Relatively greater effects are obtained with dogs. The purer the prepn. the more rapid is the fall. It seems equally rapid in well fed and in starving animals. After some time, with rabbits, if the fall be sufficiently great (from 0.037 to 0.047)

characteristic symptoms follow: a preliminary hyperexcitability gives place to a comatose condition; the animal lies on its side, breathes rapidly (often periodically), with sluggish conjunctival reflex and widely dilated pupils. Slight stimulation causes violent clonic convulsions, lasting 1-2 minutes. These may occur at 15 min. intervals without stimulation. They frequently terminate in death from respiratory failure. Recovery without treatment is rare. The animals are restored to normal condition by injection of 4 g. glucose in 20% soln. Subsequent further injection of glucose may be necessary. Saline or pentose injections have no effect. In injected animals asphyxia, CO poisoning, injection of adrenaline, piqure, or ether either produce no hyperglucemia, or, if produced, it is much less in amt. than in normal animals. V. Effect produced on the respiratory quotient by injections of insulin. (F. G. B., C. H. B., J. B. C., J. H., J. J. R. M.).—Injection of insulin, followed by administration of cane-sugar or glucose orally or subcutaneously, produces in both depancreatized dogs and human diabetics a distinct rise in respiratory quotient. VI. Effect of insulin on the percentage amounts of fat and glycogen in the liver and other organs of diabetic animals. (F. G. B., C. H. B., J. B. C., J. J. R. M., E. C. N.).—Insulin given to sugar-fed diabetic animals causes storage of glycogen in the liver (up to even 13%), reduction of heart glycogen to within normal limits, possible increase of skeletal-muscle glycogen, reduction of liver and blood fat. VII. Effect of insulin on the excretion of ketone bodies by the diabetic dog. (F. G. B., C. H. B., J. B. C., J. J. R. M.).—In diabetic dogs with well developed ketonuria injection of insulin causes disappearance of acetone bodies from the urine for several days.

A. T. CAMERON

The influence of water intake on the invisible excretion of water by the skin. O. MOOG AND E. TH. NAUCK. *Z. ges. exper. Med.* 25, 385-95(1921).—Large H<sub>2</sub>O intake influences for a short period the invisible excretion of H<sub>2</sub>O by the skin. There is an individual variation in this respect ranging between 7 and 40% increase with a similar variation as to time.

E. B. FINK

The appearance of digestive enzymes during fetal life. C. PORCHER AND A. TAPERNOUX. *Compt. rend. soc. biol.* 83, 619-20(1920); *Expt. Sta. Record* 44, 865.—The authors report the presence of trypsin, pancreatic amylase, pancreatic lipase, pepsin, and erepsin in the digestive tracts of three calf fetuses aged 75, 100, and 180 days, resp.

H. G.

The proportion of calcium in the blood of various species. P. MAZZOCCO. *Anales soc. quim. Argentina* 9, 313-25(1921).—The distribution of Ca in the blood of various animals was studied, several specimens of each species being used. Samples of serum dealbuminized with Na picrate soln. yielded slightly less Ca than when CCl<sub>3</sub>COOH was used. No difference was observed between citrated and hirudinized blood. The av. amts. of Ca found are expressed in mg. per 100 cc., the figures being given in the order: entire blood, plasma, corpuscles, serum (citrated blood). Man, 7.15, 9.31, 1.23, 9.39. Dogs, 7.57, 10.12, 1.13, 10.57. Horses, 7.71, 10.57, 0.97, 10.57. White rats, 6.77, 8.60, 1.11, 8.66. Hens, 7.30, 9.19, 1.60, 9.23. Rabbits, 8.43, 9.92, 1.14, 9.23. Cats, 7.15, 8.93, 0.83, 9.31. Goats, 8.07, 10.13, 1.09, 10.63. Sheep, 8.10, 10.80, 1.23, 10.97. Oxen, 6.43, 8.31, 1.13, 8.37. Pigs, 7.12, \*9.22, 1.44, 9.30.

I. E. GILSON

Remarks on the study of M. Bürger "The action of the intravenous injections of hypertonic solutions of various types of sugars on the respiratory metabolism of the dog." W. FALTA. *Biochem. Z.* 130, 142(1922); cf. *C. A.* 16, 953.—Bernstein and Falta (*C. A.* 13, 974) reported similar results on man which were neglected by Bürger.

F. S. HAMMETT

Salivary secretion in infants. CLEMENT NICORY. *Biochem. J.* 16, 387-9(1922).—The saliva was collected by giving infants plugs of gauze weighing 500 mg. to suck; the amt. of saliva was estd. by the increase in weight of the plugs. Ptyalin was present in

saliva of premature infants at least  $1\frac{1}{2}$  months "before term," although in small quantities. The amt. of enzyme increases until one year is reached, when its quantity equals that of the adult. The amt. is also dependent upon the health of the child, more being present in the saliva from a strong than from a weak child. B. H.

**Zinc content in the organs of the rabbit and of some other vertebrates.** GABRIEL BERTRAND AND R. VLADESCO. *Bull. soc. chim.* 31, 268-72(1922); cf. C. A. 15, 3871.—Practically all parts of the rabbit contain Zn ranging from 5.1 mg. per 100 g. of dry matter in bone with marrow, to over 30 mg. in the skin and hair. Liver in one instance contained 50.6 mg., in another 12.1. Blood contained 14.8 mg. per 100 g. dry matter. Similar amts. of Zn were found in the brain, liver and muscles of the calf, ox and sheep, and in the muscles of the pig, eel and plaice. Yolk of egg contained 9.9 mg. but Zn was not found in the white, shell or membrane. L. W. RIGGS

**Variations in the circulation in experimental anemia.** P. MORAWITZ AND G. DENCKE. *Arch. expul. Path. Pharm.* 91, 37-45(1921).—Arterial and venous bloods were obtained by cardiac puncture from normal and anemic rabbits and the specimens so obtained were subjected to gas analyses. In the anemic animals the circulation is accelerated, the increase being somewhat in proportion to the severity of the anemia. Comparison of the absolute  $O_2$  loss in the circulation showed that in the anemic animals the figure was about 60% of the normal value (3.1% as compared with 5.17% in the normal) but that the % loss from the blood was somewhat higher than normal (36.8% as compared with the normal value of 32.1). G. H. S.

**Function of the pancreas.** LEO ADLER. *Arch. expul. Path. Pharm.* 91, 110-24 (1921).—Thymus ext. and adrenaline act like thyroid ext. when injected into hibernating hedgehogs, in that the metabolic processes are accelerated and the animals are awakened. Pancreatic ext. is inactive in this respect. The response of a hibernating hedgehog to thyroid ext. is diminished or prevented if pancreatic ext. prepd. from another hibernating hedgehog is injected along with the thyroid ext. Pancreatic ext. also inhibits the stimulating effect of thymus ext., of adrenaline, and of amines such as mixt. of tyramine and phenylethylamine, or histamine and tyramine. The pancreas appears, in the hibernating animal, to inhibit metabolic processes. G. H. S.

**Sphincter of the bile duct.** FELIX REACH. *Arch. expul. Path. Pharm.* 91, 170-2 (1921).—Expts. upon guinea pigs, in which the brain was eliminated by decapitation, showed that the sphincter of the bile duct could be reacted upon by the contents of the stomach; filling the stomach closed the duct; emptying the stomach opened it. The introduction of fluids, acid, alk., or neutral, into the intestine failed to stimulate the same reflex mechanism and react upon the sphincter. Physostigmine given subcutaneously in doses of 10-40 mg. per kg. of body wt., or cocaine in doses of 10 mg. given intravenously also closed the duct. G. H. S.

**Cause of differences in heart-nerve irritability in frogs at different seasons of the year. The peripheral antagonism of the vagus and sympathetic system. Effect of thyroid substance.** KARL CORI. *Arch. expul. Path. Pharm.* 91, 130-55(1921).—At all times both the vagus and the sympathetic are active. There is a reciprocal effect between them so that if one system is rendered inactive the other shows increased activity. The differences in the response to vagal stimulation in summer and in winter frogs are apparently associated with the activity of the thyroid and are not due to alterations in the K or Ca content. G. H. S.

**Respiration of inflamed tissue.** H. GESSLER. *Arch. expul. Path. Pharm.* 91, 366-76(1921).—The gaseous metabolism of portions of cutaneous tissue into which mustard oil and formic acid were injected was compared with that of normal skin from the same animal. In the 3 protocols reported the  $O$  consumption of the inflamed skin was 56, 77, and 36% greater than that of the normal. G. H. S.

## G—PATHOLOGY

H. GIDRON WELLS

**Hyperglucemia and glucosuria caused by tying rabbits.** I. IJURO FUJII. *Tohoku J. Exptl. Med.* 2, 9-64(1921).—The blood sugar of rabbits tied for 3-6 hrs. is increased from 0.12 to 0.44%. The increase is greater in winter and spring than in other seasons. The body temp. drops at the same time, but this drop is not parallel with the increase in blood sugar. After double splanchnectomy the body temp. did not drop but the hyperglucemia was produced. The extirpation of the first 3 sympathetic ganglia in addition to the above operation does not alter the hyperglucemia. II. *Ibid* 531-61.—A further study of seasonal differences of this form of hyperglucemia.

H. V. ATKINSON

**Changes in the dissociation curve of the blood in experimental fever and febrile diseases.** MATAJURO JARNAKITA. *Tohoku J. Exptl. Med.* 2, 290-323(1921).—The relative satn. of the blood with O decreases in fever caused by the injection of peptone, Koch's old tuberculin and typhoid toxin (rabbits). The last gives the greatest increase in body temp. This decrease in O satn. is marked in rabbits at death resulting from heat-puncture fever. There is also a decrease in pulmonary tuberculosis, influenza-pneumonia, and typhoid fever, but not in the first when the body temp. is normal. When the decrease in influenza-pneumonia is considerable, it is accompanied by a high degree of dyspnea, while cyanosis is not a const. attendant of the decreased % satn. or of diminished alk. of the blood. The satn. of the blood with O increases within 5 min. after the intravenous injection of  $\text{Na}_2\text{CO}_3$ . The treatment of acidosis should be undertaken in fevers.

H. V. ATKINSON

**The blood sugar content of the heat-punctured rabbit.** SACHIKADO MORIYA AND MASURU NAITA. *Tohoku J. Exptl. Med.* 2, 562-9(1922).—The heat puncture was carried out on rabbits according to Arohnson and Sachs (*Arch. ges. Physiol.* 37, 235(1885)). Neither hyperglucemia nor glucosuria was found in the heat-punctured rabbits whose body temp. rose to 41.5°.

H. V. ATKINSON

**Changes in the oxygen-combining power of the blood (acidosis) in experimental obstruction of the intestines and the effect of some treatments on them.** TSUTOMU ODAIRA. *Tohoku J. Exptl. Med.* 2, 570-98(1922).—Progressive acidosis develops in rabbits when the intestinal tract is experimentally obstructed. There is an individual variation in its rapidity and severity. The time after the obstruction of the intestines till the appearance of acidosis is: duodenum 6 hrs., lower end of ileum 11 hrs., lower end of colon 36 hrs., pylorus 15 hrs. The progress of acidosis is most rapid in the case of pyloric obstruction, and second the duodenum. The general symptoms progress parallel to lowering of the blood alk. Pyloric obstruction is an exception, here the ilcus symptoms appear in 2-3 hrs. after the operation and are very extensive, while the acidosis presents itself much later. The duration of survival after the obstruction is: pylorus 20 hrs., lower end of duodenum 34 hrs., lower end of ileum 63 hrs., and lower end of colon 73 hrs. The influences of laparotomy and fastening are negligible on acidosis of this sort. The intravenous administration of a  $\text{NaHCO}_3$  soln. lessens the acidosis and prolongs life. The intravenous infusion of saline exerts no influence upon the change of the blood alk., and though the general conditions are for a while slightly improved after it, the time of survival is not prolonged. Intravenous injection of  $\text{CaCl}_2$  aggravates the symptoms. The administration of antiseptics into the bowel has little effect.

H. V. ATKINSON

**The blood sugar content of the cold-punctured rabbit.** SACHIKADO MORIYA. *Tohoku J. Exptl. Med.* 2, 403-45(1921).—Desiring to study the mechanism of cold-glucosuria without cooling the skin artificially, M. used E. Leschke's cold-puncture,

which he calls "inter-brain puncture," on rabbits. The blood sugar content of the cold-punctured rabbit begins suddenly to increase as soon as the body temp. descends to 30°. Glucosuria occurs. Failure of the cold hyperglucemia-glucosuria is due to the insufficiency of the liver glycogen. The cold-puncture hyperglucemia-glucosuria cannot be induced in the rabbit with bilateral splanchnectomy; therefore, it is of central origin. The activity of the nervous mechanism of the sugar mobilization is intact in the cold-punctured rabbit.

H. V. ATKINSON

Can the cold-puncture hyperglucemia be reduced by raising the body temperature artificially? SACHIKADO MORITA. *Tohoku J. Exptl. Med.* 3, 136-41(1922).—Yes.

H. V. ATKINSON

Diabetes mellitus and diabetes insipidus. J. MUNK. *Nederland. Maandschr. Geneeskunde* 10, 253-68(1921).—M. reports on cases of diabetes in children, 5 to 9 years old; one of the cases (diabetes insipidus) was cured by a hypophysis prepn. The relation established by Chabanier (*C. A.* 14, 2514) concerning the connection between sugar in the blood and acetone in the urine is found to be correct. The calcn. of the CO<sub>2</sub> content of the plasma from the acidity of the urine according to Van Slyke (*C. A.* 11, 2207) is found to agree with the direct detn.

R. BEUTNER

Sedimentation reaction in pregnancy. J. T. KELLERMANN-SLOTENMAKER. *Nederland. Maandschr. Geneeskunde* 10, 320-41(1921).—According to Fahræus and Linzenmeyer (*Arch. Gynaekol.* 113 (1920); cf. *C. A.* 15, 2890) the red blood cells in the blood of pregnant women settle down (or ppt.) considerably more quickly than in the blood of normal individuals. K.-S. corroborates this. It is possible to decide whether or not pregnancy exists, however, only if pathol. cases are excluded as patients suffering from infectious diseases or carcinoma also exhibit an increased ppt. of the red blood cells. The reaction is performed by mixing 0.2 cc. 5% sodium citrate soln. with 0.8 cc. blood and watching the sedimentation during 1/2 or 1 hr. Heating the blood to 60° entirely checks the reaction; K.-S. concludes that an enzyme action is involved. Addn. of glycerol or some drops of a 10% soln. of gelatin considerably accelerates the reaction.

R. BEUTNER

Sugar content of the blood and spinal fluid in epidemic encephalitis. W. THALHIMER AND HELEN UPDEGRAFF. *Arch. Neurol. Psychiatry* 8, 15-23(1922).—Study of 14 cases shows sugar of blood and spinal fluid increased (maxima observed 0.297 and 0.177, resp.). Spinal fluid sugar appears to increase only after a certain level of blood sugar has been reached.

A. T. CAMERON

Parathyroid therapy in calcium deficiency. H. W. C. VINES. *Proc. Roy. Soc. Med.* 15, Sect. Therap. and Pharmacol., 13-8(1922).—Chronic toxic cases, mostly ulcerative, have improved markedly after intramuscular injection of CaCl<sub>2</sub> and subsequent oral administration of parathyroid. In a series of gastric ulcers parathyroid administered alone gave considerable benefit.

A. T. CAMERON

Does tuberculosis completely heal? Do tuberculin hypersensitiveness and immunity remain? Anergy the answer. C. KRAEMER. *Beitr. klin. Tuberkulose* 49, 239(1922).—Pathologic-anatomic studies lead to the conclusion that there is a bacteriologic-anatomic healing of tuberculosis with disappearance of all tubercle bacilli. Cases of clinically healed tuberculosis lose the power to react generally to even 200-450 mg. tuberculin. Anergy can result from an overproduction of antibodies which neutralize extremely large amts. of tuberculin; it can occur during cachexia and disturbances of the reaction power during pregnancy and after certain diseases (measles, influenza etc.). After complete anatomic-bacteriologic healing of tuberculosis there can be an absence of tuberculin hypersensitiveness but there is also no immunity. H. J. CORPER

The action of various metallic salts on hemolysis. HELEN A. PURDY AND L. E. WALBUM. *J. Immunol.* 7, 35-45(1922).—The significance of the presence of small



quantities of metallic salts on the hemolytic action of saponin on horse blood corpuscles, of staphylolysin on goat blood corpuscles and of complement-amboceptor on sheep blood corpuscles was studied. By detg. the minimal dose of the individual salts (in molar soln.) at which their action is demonstrable, it is possible to obtain a comparison between the action of the different salts. While some salts exert an inciting action on hemolysis, others exert an inhibitive one (positive and negative catalysis?); some show an inciting effect at one concn. and an inhibitive one at another. The anion in the salts seems to be without significance as regards their action in either favoring or inhibiting hemolysis.

E. B. FINK

An allergic reaction of the tuberculous uterine horn. G. H. SMITH. *J. Immunol.* 7, 47-50(1922).—The urine of tuberculous individuals was found to contain substances which stimulate uterine strips from tuberculous guinea pigs to contraction when tested by the Schultz-Dale method.

E. B. FINK

Relationship of various anti-organ sera. MOYER S. FLEISHER. *J. Immunol.* 7, 51-67(1922).—Various tissues apparently contain substances or chem. compds. which are more definitely related to and show a specificity to certain substances contained in other tissues. It is, however, not certain that these non-homologous tissue sp. substances are chemically and immunologically identical with the tissue sp. substance of the particular tissues; they may only be similar. The demonstration of this type of antigen in the tissues and of the corresponding antigen in the antiserum adds only to the complexity of these tissue antigens and antibodies. Cf. *C. A.* 15, 2120. E. B. FINK

Studies in specific hypersensitiveness. I. The diagnostic cutaneous reaction in allergy. Comparison of the intradermal method (Cooke) and the scratch method (Schloss). AARON BROWN. *J. Immunol.* 7, 97-111(1922).—Two methods of applying the skin test in allergic conditions are in use: (1) the cutaneous or scratch method of Schloss and (2) the intradermal or injection method of Cooke. Two forms of test proteins are in use: (1) the dry powdered preps. made according to the methods described by Wodehouse and (2) the fluid preps. originally used by Cooke and now made according to the methods described by Coca. In a series of 78 comparative tests the intradermal method has shown itself superior to the scratch method. III. Constitutional reactions. The dangers of the diagnostic cutaneous test and therapeutic injections of allergins. ROBT. A. COOKE. *Ibid* 119-46.—The following are the precautions to be observed in the use of allergins: (1) The exts. used should be sufficiently dil.; (2) injections should not be repeated too frequently. Cutaneous tests should not exceed 6 to 8 at one time. The best prepn. to use in the presence of constitutional reactions is adrenaline. IV. New etiologic factors in bronchial asthma. ROBT. A. COOKE. *Ibid* 147-62.—The group of substances absorbed by inhalation plays a much more important part as sp. causative factors of asthma than is generally considered to be the case by other investigators. Diagnoses arrived at in accordance with this idea may be made with a greater degree of assurance on account of the fact that they are based upon positive findings and not upon negative findings, as is the case with the so-called bacterial asthmas, which the writer insists are to be more properly classified as undiagnosed. The new procedure of testing dust exts. has yielded valuable information in that it permits a study of the occupational or domiciliary environment of an asthmatic and establishes a positive diagnosis in certain cases not obtainable by any other means. Further, it has shown the presence of a substance in most house dusts that is in itself an important factor, but the nature and source of which are as yet unknown. The dust of hay, also, may act as a sp. allergin and is not to be considered solely as a simple mech. irritant. V. The preparation of fluid extracts and solutions for use in the diagnosis and treatment of the allergies with notes on the collection of pollens. A. F. COCA. *Ibid* 163-78.—A method is described for the prepn. of solns. of proteins and pollens for

the diagnosis and treatment of asthma and hay fever. VI. *Dermatitis venenata*. W. C. SPAIN. *Ibid* 179-91.—The typical lesion of *dermatitis venenata* can be produced by means of an alc. or  $\text{CHCl}_3$  ext. of the fresh leaves of *Toxicodendron radicans* applied to the skin surface. The lesion could not be produced by intradermal injection of an active alc. ext. With the patch test, differences can be demonstrated in the susceptibility of different individuals to poison ivy, and in the incubation period of the lesion. With the technic used infants were not susceptible. VII. The age incidence of serum disease and of *dermatitis venenata* as compared with that of the natural allergies. ARTHUR F. COCA. *Ibid* 193-9.—Serum disease differs from other forms of human hypersensitiveness in the almost const. characteristic of the incubation period and in its high percentage incidence. *Dermatitis venenata* differs from the other forms of human hypersensitiveness in which the skin is affected in the constant and characteristic nature of the lesion. The age incidence of the "natural" allergies increases rapidly in the early age periods but probably does not exceed 10% in any period. The age incidence of *dermatitis venenata* increases greatly from childhood to adult life and reaches a high percentage (probably 90%). The age incidence of serum disease seems not to change during life. VIII. The relative susceptibility of the American Indian race and the white race to the allergies and to serum disease. A. F. COCA, OLIN DUBERT AND EDW. F. MENDER. *Ibid* 210-17.—Through inquiry it has been found that the American Indian is apparently much less frequently affected by the allergies than is the white race. An exptl. study of the occurrence of serum disease in 26 volunteer full-blooded American Indians indicates that the Indian race is much less susceptible to that condition than is the white race. IX. On the phenomenon of hypsensitization (the clinically lessened sensitiveness of allergy). ROBT. A. COOKS. *Ibid* 219-42.—The quant. relations in partial desensitization are contrasted with those that obtain in the state of lessened sensitiveness in allergy, the differences being such as to indicate a difference in the mechanism of these two phenomena. The phenomenon of "local exhaustion" of the allergic cutaneous reaction described by Mackenzie and Baldwin was studied and found, in disagreement with these authors, to be non-sp. It is proposed to distinguish the lessened sensitiveness induced in allergy from the state of desensitization in anaphylaxis by designating the former condition as a state of hypsensitiveness.

E. B. FINCK

The relationship of lipoids and proteins to serum reactions in tuberculosis. W. RAY HODGE AND M. F. MACLENNAN. *J. Immunol.* 7, 253-69(1922).—Evidence is introduced which indicates that the fixation bodies in human tuberculous sera are either removed or destroyed by extn. with alc.,  $\text{Et}_2\text{O}$  or  $\text{CHCl}_3$ . The substance responsible for the inhibitive reaction of Caulfield is contained almost wholly in the euglobulin fraction of the serum. Evidence is introduced to show that the substance responsible for the inhibitive reaction of Calmette is identical with that responsible for the inhibitive reaction of Caulfield.

E. B. FINCK

The toxicity of acids for leucocytes, as indicated by the tropin reaction. ALICE M. EVANS. *J. Immunol.* 7, 271-304(1922).—Leucocytes absorb H ions from weakly acid solns. If the quantity of H ions absorbed is great enough, the capacity of the leucocytes for phagocytosis is injured. In addn. to the toxicity of the dissociated H ions, lactic, acetic and butyric acids have a sp. toxicity for leucocytes. The order of toxicity of the tested acids is acetic and butyric, lactic, HCl and citric, the last being least toxic. When phagocytic tests are carried out *in vitro* it is necessary to protect the leucocytes against the influence of acid solns. This is accomplished by the use of a buffered saline soln. Some of the Na citrate on the market is of an acid reaction and therefore is not suitable for use in the prepn. of leucocytic suspensions for the tropine test. The union of the immune body (bacteriotropin) with the streptococcus was not influenced by such variations of H-ion concn. as were studied in these expts.

E. B. FINCK

The adsorption of proteins, enzymes, toxins and sera by aluminium hydroxide. M. A. RAKUSIN. *Z. Immunität.* 34, 155-93(1922).—It is suggested that  $Al(OH)_3$ , which adsorbs these substances, be used to purify antitoxins and for the purification of  $H_2O$  in the field and in institutions. Therapeutically it can be used in intestinal infections.

E. B. FINK

The effect of non-specific substances upon the production of immune bodies. K. HAJÓS AND F. STERNBERG. *Z. Immunität.* 34, 218-29(1922).—The substances whose influence was tested were NaCl, KCl,  $CaCl_2$ , Na salicylate, morphine, antipyrine and strophanthin. Of the substances acting on the vegetative nervous system, the following were used: atropine, pilocarpine, adrenaline and pituitrin. None of these various substances has any appreciable influence on the production of immune bodies.

E. B. FINK

The complement deviation reaction, the reaction of Sachs-Georgi, and the reaction of Meinicke in the diagnosis of dourine. L. COMNOTTI. *Clin. Vet., Rass. Polizia Sanit. Ig. [Milan]* 44, No. 4, 81-91(1921); *Expt. Sta. Record* 46, 277.—Tests of the value of the complement-deviation reaction for the diagnosis of dourine are reported, from which C. concludes that the test is significant only when the result is positive. In many cases negative results were obtained with sera of animals showing typical clinical symptoms. Occasionally a negative reaction is given in primary stages of the disease and a positive one in later stages. The Sachs-Georgi and Meinicke reactions are considered to be without value in the diagnosis of dourine.

H. G.

The chromophoric cells of human skin: their nature and the origin of their pigment. G. MIESCHER. *Klin. Wochschr.* 1, 125(1922).—Bloch has shown that the pigmentation of the epidermis is an oxidation reaction caused by an enzyme that he called Dopa-oxidase. This enzyme has the highly characteristic faculty of oxidizing dopa (dihydroxyphenylalanine) with formation of a brown to black color. Pigmentation of the cells of the corium is not caused by an oxidation reaction. Dopaoxidase is not present in this layer. One of the characteristic faculties of connective tissue cells is their power of phagocytosis toward many substances, including melanin. Melanin is sol. in the tissue protoplasm. If melanin is injected into the skin, typical pigmented cells appear in the corium that are indistinguishable from the natural pigment cells. The epithelial cells of the epidermis lack the power of phagocytosis completely; hence they do not absorb melanin. No pigment is generated in the cells of the corium. These cells acquire pigment only when they can absorb it from an outside source. This source is, normally, the epithelial cells of the epidermis; hence changes in the degree of pigmentation of the epidermis soon lead to corresponding changes in the corium. M. H.

Genesis of pigment in the eye: the nature of the pigment. G. MIESCHER. *Klin. Wochschr.* 1, 173-4(1922).—A dopaoxidase (cf. preceding abstr.) is also responsible for the pigmentation of retinal pigment; but in this case the oxidase is present only during a very short and definite period of the embryonic life of the animal. Following this brief period of intense activity the enzyme disappears and does not recur during the entire life of the animal. The chicken embryo shows a positive dopa reaction on the 4th day of incubation which reaches its max. intensity within the following few days, is then limited to the regions of growth (corpus ciliare and iris) and has disappeared entirely when the chick leaves the egg. In the rabbit embryo a positive dopa reaction is obtained on the 11 or 12th day of incubation which becomes maximal within a few days and then disappears entirely so that a negative or doubtfully positive reaction is obtained even before the birth of the animal. The oxidase also occurs in the pigment cells of the choroid during the latter part of the embryonic life and disappears before or soon after birth. It is impossible to revive or reactivate this dopaoxidase activity in the mature eye by stimulation with X-rays. In post-embryonic life the enzyme is no longer present

even in potentia. Pigmentation in the eye differs from the analogous pigmentation in the skin in the following respects. The oxidase is present in the epithelial layer of the skin throughout life. The corium contains no oxidase. The retinal epithelium contains oxidase only in the embryonic state. The choroid, which is analogous to the corium of the skin, contains oxidase in the embryonic state. Since the oxidase activity is so characteristic for dopa, the author believes that the precursor of the pigment must have a chem. compn. at least analogous to dopa.

MILTON HANKE

The action of high altitudes on the blood and the exchange of liquid between the blood and the tissues. FRITZ LAURER. *Klin. Wochschr.* 1, 163-6(1922).—The work was done at the Intern. Inst. f. Höhenforschung (on the south side of Mt. Rosa, altitude 2900 m.) and at Frankfurt a.M. (altitude 91 m.). Erythrocyte counts were made with the aid of a Bürker counting chamber. Hemoglobin was detd. with an Autenrieth colorimeter. The 2 counts usually varied together. A noticeable increase in the no. of erythrocytes did not occur until the subject had been living at the high altitude for 8 days. A max. increase (16%) was obtained at the end of 3 weeks. This represented an increase from 5.2 to 6.0 million erythrocytes per cc. The return trip to Frankfurt took 3 days during which time no counts were made; but on the 4th day the erythrocyte count was again 5.2 million, the hemoglobin value being only slightly above normal. A set of expts. was now carried out on 12 dogs to ascertain the rate of blood regeneration at sea level and at high altitude. Approx.  $\frac{1}{3}$  of the total blood was withdrawn; the rate of regeneration was then followed by daily blood counts. Twenty-seven days were required for complete regeneration at sea level; only 16 days were required at the high altitude. Protracted marches in high altitudes lead to a decrease in the no. of erythrocytes and an increase in the protein content of the blood. The profuse sweating may lead to a loss in wt. of as much as 5 kg. in 1 day if the food intake is normal but the water supply restricted. Nearly half of this lost wt. can be recovered in an evening if water contg. NaCl is ingested. Salt-free water is not retained well and does not satisfy the feeling of thirst. The practical significance of this fact to mountain climbers is obvious. L. concludes that high altitude atm. has a stimulating effect upon the production of erythrocytes. The number of erythrocytes in normal individuals are increased and the rate of regeneration in anemics is also increased. L. does not believe that the O tension at an altitude of 3000 m. is sufficiently low to account for this effect entirely.

MILTON HANKE

The Wildbolz tuberculosis antigen reaction of urine in infants. A. E. ALDER. *Klin. Wochschr.* 1, 170-1(1922).—Wildbolz claimed in 1919 to have demonstrated the presence of tuberculosis antigen in the concd. urine of tuberculous adults. Such urine when injected subcutaneously into the person himself was said to give rise to characteristic infiltration of the injected area. A positive reaction was not obtained under similar conditions with non-tuberculous persons. A. has repeated the work on 41 children, 30 of whom were normal, 5 tuberculous and the rest afflicted with the grippe and bronchitis. Of the normal children, and those afflicted with grippe and bronchitis, 80% gave a positive Wildbolz reaction although a tuberculin reaction was not obtained in any case. Nineteen of the healthy children showed a rise in temp. that persisted for from 24 to 48 hrs., a condition that is not found to occur in adults. A. concludes that the Wildbolz reaction is not caused by the presence of tuberculosis antigen in the urine and is not sp. for tuberculosis.

MILTON HANKE

The action of the phosphoric acid ion on blood and urinary sugar. H. ELLAS AND ST. WEISS. *Wiener Arch. inn. Med.* 4, 29-58(1922).—Intravenous injections of hypertonic solns. of  $\text{NaH}_2\text{PO}_4$  and  $\text{Na}_2\text{HPO}_4$  usually lower the sugar content of the blood in diabetic and alimentary hyperglycemia while the sugar content of normal blood is unaltered. This lowering of the blood sugar content is accompanied and followed by a

decreased excretion of sugar in the urine. The decrease in blood sugar continues 2-4 hours, while there may be a decreased excretion of sugar for 3 days. The phosphates seem to act directly on the intermediary metabolism and also perhaps indirectly on the kidney. The effect is due to the  $\text{PO}_4$  ion, as is shown by controls with other salt soles. Alkaline  $\text{Na}_2\text{HPO}_4$  is 3 times as effective as acid  $\text{NaH}_2\text{PO}_4$ . The cause of this effect cannot lie in a decrease of the P content in the blood serum of diabetics as the P values are the same in diabetic and normal serums. There is no evidence for a formation of dextrose diphosphoric acid to explain the reduction in sugar content, for blood taken at the height of the effect does not show more carbohydrate after hydrolytic or fermentative splitting than before. There is also no indication of oxidative glucolysis in the blood, for while the sugar content of the circulating blood fell, the sugar content of blood collected at the beginning of the expt. remained const. *in vitro*. The sugar disappears from the blood under the influence of the  $\text{P}_2\text{O}_5$  either through some process of combustion or through storing up of a carbohydrate or carbohydratephosphoric acid in the tissues, perhaps through an altered permeability of the membrane of the muscle cells.

HARRIET F. HOLMES

**Studies on the water test.** I. DANIEL AND F. HÖGLER. *Wiener Arch. Inn. Med.* 4, 167-189 (1922).—The Volhard  $\text{H}_2\text{O}$  test for kidney function consists of the ingestion of 1 to 1.5 l.  $\text{H}_2\text{O}$  and the detn. of the amt. and sp. gr. of the urine at  $1\frac{1}{2}$  hr. intervals for 4 hrs. For the following 20 hrs. a dry diet is given and the urine examd. at intervals of 3-4 hrs. This test is modified by extending the period of the half hourly exams. to 6 hrs. and adding erythrocyte counts, viscosity detns. of the whole blood, and weighing the patient before and at the end of the 6-hr. period. Counting of the erythrocytes controlled by viscosity detns. of the blood is the best method for detg. changes of concn. in the blood after the ingestion of  $\text{H}_2\text{O}$ . After the ingestion of large amts. of water, under normal conditions, a hydremia sets in rapidly which affords an adequate stimulus for the hydrotic function of the kidney. This hydremia is the result for the greater part of a hyperplasmia, to a lesser extent of a hydroplasmia and a hydroglobulia. In pathol. conditions this modification of the water test indicates whether  $\text{H}_2\text{O}$  is retained and to what extent, where the retained  $\text{H}_2\text{O}$  is to be found, in the blood or in the tissues, and whether there is present a hydrotic disturbance of kidney function or a tendency to edema or both conditions.

HARRIET F. HOLMES

**Amino-acid deficiency probably the primary etiological factor in pellagra.** J. GOLDBERGER AND W. F. TANNER. *U. S. Pub. Health Repts.* 37, 462-86 (1921).—An excellent summary is presented of the evidence in favor of the theory that diet is the primary controlling factor in the prevention and causation of pellagra. The present study has shown that diets adequate in the supply of mineral elements and known vitamins did not prevent the recurrence of pellagra in pellagrins. It is considered that with the exclusion of these 2 factors the dominating role of diet in the causation of pellagra must be referred primarily to the character of the protein (amino acid) supply, probably in the nature of a deficiency of some special combination of amino acids. In preliminary therapeutic trials with amino acids, the dermal lesions in each of 2 cases seemed to show a favorable reaction to cystine and in a third case, administration of cystine and tryptophan was accompanied by a gain in wt. and some improvement in diarrhea.

H. B. LEWIS

**Hormone therapy.** OTTO FÜRTH. *Wiener klin. Wochschr.* 34, 521-2 (1921).—A brief didactic review.

W. A. PERLZWEIG

**Preventive action in syphilis of the sodium salt of acetoxyaminobenzenearsonic acid.** L. FOURNIER, C. LEVADITI, A. NAVARRO-MARTIN AND A. SCHWARTZ. *Compt. rend.* 174, 1380-2 (1922).—The drug is designated by the number 190. Expts. with 21 rabbits showed that doses of 190 not less than 0.1 g. per kg. by mouth, 2, 5, 6, 12 and

24 hrs., 2 and even 7 days after spirochetic infection, acted as a preventive to the development of the disease. Infection was made by scarification and the application of virus Pg. or virus Truffi, also by sexual contact. Expts. upon a man of 32 years who had never had syphilis and was negative to the Bordet-Wassermann test proved that a dose of 2 g. of 190, administered by mouth 5 hrs. after a massive infection, gave complete protection.

L. W. RIGGS

**Balanced diet and diabetic acidosis.** A. DESGREZ, H. BIERRY AND F. RATHERY. *Compt. rend.* 174, 1576-8(1922); cf. C. A. 15, 3682; 16, 1620.—From feeding trials with diabetics accompanied by quant. analyses of the urine it was concluded that, with a well balanced diet adapted to each particular case, the elimination of glucose and the ketonic substances in the acidotic diabetic may fall to a level near that of the fasting patient. The balanced diet should give progressively, without exceeding, the max. amt. of carbohydrates that can be assimilated. It is suggested that along this line and not in the suppression of proteins, fats or even sugars, the dietetic problem of the diabetic may be solved.

L. W. RIGGS

**Effects of various types of inanition upon the mitochondria in the gastrointestinal epithelium and in the pancreas of the albino rat.** SHIRLEY P. MILLER. *Anal. Record* 23, 205-10(1922).—Changes in the mitochondria of the gastrointestinal epithelial cells and the gland cells of the pancreas may follow acute starvation or vitamin deficiency (water-sol. A deficiency; diets of gelatin or zein) in white rats. The mitochondria may partially or completely disappear, or their rod-shaped structure may be modified so as to assume a spherical form.

G. H. S.

**Further studies on the mechanism of the so-called Abderhalden reaction. VI. Use of cell or tissue proteins in place of organ substrates. Additional observations on the "direct" and other methods.** E. ABDERHALDEN. *Fermentforschung* 5, 342-58 (1922); cf. C. A. 16, 1986.—Placenta protein is prepd. thus: The tissue is freed from extraneous matter, finely cut and partially dried on a glass plate in an air current. It is then rubbed up with quartz sand and extd. with 0.9% NaCl soln. contg.  $\text{CHCl}_3$  and toluene for 12 hrs. at  $37^\circ$ . The aq. layer is sepd. and after acidification with AcOH the protein is pptd. by heat coagulation. It is washed by heating with a small quantity of water and is then employed moist or after drying. The ninhydrin test applied to the protein filtrate should be negative. Plates show the results obtained with placenta protein; the simplified or direct procedure being used. Recent experience with the direct method shows that it cannot replace the dialysis procedure for a variety of reasons; it is difficult to prevent bacterial action and toward the end of pregnancy macroscopic changes are not apparent. In using the ninhydrin test or the interferometer as a measure of digestion it was found that in the case of the mare dry placenta gave a better result than moist placenta.

R. L. STEHLE

**Racial biological studies with isohemagglutinins.** F. VERZAR AND O. WESZECZKY. *Biochem. Z.* 126, 33-39(1921).—Landsteiner has shown that the blood corpuscles of some individuals are agglutinated by the blood serum of others. Four different groups have been formed. V. and W. attempted to det. whether races of peoples which have lived in close contact with each other over a long period of time would differ with regard to their isohemagglutinins. The study was made on Germans, Hungarians, and Gypsies. The general technic of the tests can be obtained from the original paper. The work of V. and W. indicates that by means of their isohemagglutinins, these three races can be differentiated even after centuries of mixing. Gypsies, who have been separated for almost six centuries from their kindred, can still be identified. The other two races gave the same results.

F. W. TANNER

**Improved method for using phenoltetrachlorophthalein as a liver function test.** S. M. ROSENTHAL. *J. Pharmacol.* 19, 385-91(1922).—Phenoltetrachlorophthalein

has been injected intravenously and its subsequent concn. in the blood studied. In normal dogs there is an immediate rise to approx. 10%, rapidly falling to only a trace or to complete disappearance in 15 min. When the liver is damaged the amt. of dye in the blood reaches 15 to 30 or more % and remains elevated for a prolonged period, 11% having been recovered almost 2 hrs. after injection. There is evidence that the curves obtained parallel the degree of impairment of liver function and it is believed that the method can be applied clinically as a quant. test for liver function. C. J. WAST

Detection of ricin in feeding stuffs by means of serological methods as well as hemagglutination (PFILLER, ENGELHARDT) 12.

LÖWENSTEIN, E.: Lectures on the Bacteriology, Immunity, Specific Diagnosis, and Therapy of Tuberculosis. Jena: Gustav Fischer. 476 pp.

MACCALLUM, W. G.: A Textbook of Pathology. 2nd Ed. revized. Philadelphia & London: W. B. Saunders's Co. 1155 pp.

MUCH, HANS: Partial Antigen Laws and their General Applicability. Leipzig: Curt Kabitzsch. Reviewed in *Abstracts Bact.* 4, 411(1920).

MUCH, HANS: Pathological Biology. 3rd Ed. Leipzig: Curt Kabitzsch. Reviewed in *Abstracts Bact.* 4, 412(1922).

WILDER, RUSSELL M.: Diabetic Primer. Philadelphia: W. B. Saunders Co. Reviewed in *Nation's Health* 4, No. 7, adv. p. 38(1922).

#### H—PHARMACOLOGY

ALFRED N. RICHARDS

The styptic effect of ergot preparations on pulmonary hemorrhage. MAKOTO MAEDA. *Tohoku J. Exptl. Med.* 2, 1-8(1921).—The constriction of the bronchial musculature of cats when given ergot, diminishes pulmonary hemorrhage. The rise in blood pressure following the constriction of the pulmonary vessels from the same cause increases it. Since the former predominates ergot is beneficial in this condition.

H. V. ATKINSON

Can surgical narcosis be produced by the intravenous injection of alcohol? KO-SHIRO NAKAGAWA. *Tohoku J. Exptl. Med.* 2, 81-126(1921).—The intravenous injection of 0.9% NaCl soln. contg. 7% alc., 5% Et<sub>2</sub>O, or 0.63% CHCl<sub>3</sub> is satisfactory, but 10-15% alc. is best.

H. V. ATKINSON

Ether hyperglucemia and glucosuria in the rabbit. IJURO FUJII. *Tohoku J. Exptl. Med.* 2, 169-208(1921).—Ether narcosis of 5-7 hrs. duration produces hyperglucemia in normal but not in fasted rabbits. The increase in blood sugar (max. 0.45%) varies directly with the depth of the narcosis. The severity of the glucosuria varies directly with the hyperglucemia. Ether glucosuria but not hyperglucemia is diminished by protection against fall of body temp. Both are less severe after bilateral splanchnectomy. Unilateral splanchnectomy causes no change from normal.

H. V. A.

The dependence of the nature of caffeine diuresis upon the dose used. I. Renal oxygen consumption and blood flow during caffeine diuresis. KASANO TASHIRO AND HIDESCHIRO ABE. *Tohoku J. Exptl. Med.* 3, 142-54(1922). II. The vital staining of the kidney under caffeine diuresis. *Ibid* 3, 155-62(1922).—Caffeine and its allies influence the gas metabolism of the kidneys in different ways according to the amt. administered. A small dose augments the O intake of the kidney, while the use of a large dose depresses it. Caffeine diuresis due to a small dose is due to stimulation of the active secretory elements of the kidney. It is often accompanied by increase in the blood flow through the kidney which may support the diuretic action. Under a large dose of caffeine the blood flow through the kidney is unchanged or reduced. Reabsorption actively takes place, chiefly in the distal part of the convoluted tubules and the wide part of Henle's loop.

H. V. ATKINSON

**Experimental injections of adrenaline in mental diseases.** E. J. STUURMAN. *Nederl. Maandschr. Geneeskunde* 11, 44-59(1922).—Subdermal injection of 0.7 mg. adrenaline causes an increase of the systolic blood pressure and accelerates the pulse while the diastolic pressure decreases in most cases or remains unchanged. In epileptics the reaction of the blood pressure is weaker, but there is often glucosuria. Adding alkali counteracts the action of adrenaline. R. BRUTNER

**Intravenous administration of iodides.** F. J. FARNELL. *Arch. Neurol. Psychiatry* 7, 729-32(1922).—Iodides can be given in hypertonic form (e. g., 10% NaI) intravenously, and so given have a tendency to reduce the idiosyncrasy towards iodism. Systemic fungus disturbances (oidiomycosis) are readjusted very rapidly, while the action of arsphenamine appears to be assisted. Edema and hyperemia of the brain in increased brain bulk disorders seem to be reduced. A. T. CAMERON

**Poisoning by butter of antimony.** W. BELL. *Brit. Med. J.* 1922, I, 917-8.—A case of fatal poisoning after ingestion of not more than 6 drachms of commercial SbCl<sub>5</sub>. A. T. CAMERON

**Amebicidal action of conessine.** H. C. BROWN. *Brit. Med. J.* 1922, I, 993-4.—Conessine, C<sub>15</sub>H<sub>25</sub>N, exerts a strong inhibitory action on the growth of free-living amebas (exactly equal to that of emetine, though its toxicity is only one-half). Infusions of the seeds of plants of the family Apocynaceae (which yield conessine) have been used with marked success in chronic dysentery. A. T. CAMERON

**Intravenous injection of a new mercurial in treatment of syphilis.** W. T. WILLIAMS. *Can. Med. Assoc. J.* 12, 401-2.—Beneficial results are claimed in 4 cases after treatment with "mercurosal" (synthesized from mercuric acetate and "salicylacetic acid"). A. T. CAMERON

**Therapeutic and pharmacological action of some new sulfur compounds.** J. E. R. McDONAGH. *Proc. Roy. Soc. Med.* 15, Sect. Therap. and Pharmacol., 19-22 (1922).—The CS<sub>2</sub> compd. of NH(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>, contg. 28.4% S, and sol. in normal saline soln., 1 in 2.5, is more powerful therapeutically than its iodized deriv. (contg. 9.2% S and 50% I) and both are more active than intramine. They have the same uses as intramine, can be employed locally to heal sluggish wounds, injected intravenously or intramuscularly to prevent and combat metallic intoxication, and are particularly useful in late syphilitic lesions, chronic gonococcal complications, arthritis, and in certain chronic dermatoses. The first, injected intravenously into a 2 kg. rabbit in 0.25 g. doses weekly, is fatal after injection of 2 to 2.5 g. Large doses can be injected into man with impunity if protected with glucose (0.25 g. in 10 cc. normal saline contg. 10% glucose). The compds. are more active and less toxic than allylthiourea and its Na salicylate and EtI compds. The corresponding Me compds. are more toxic. A. T. CAMERON

**Germicidal character of the emanations from colloids of certain silver salts.** E. G. BALLENGER AND O. F. ELDER. *Surgery, Gynecology, Obstetrics* 35, 57-63(1922).—Colloidal Ag salts, especially AgCl, give off definite germicidal emanations which prevent the growth of microorganisms on Petri agar plates in the immediate area surrounding the sealed glass tubes contg. the colloidal AgCl. A 1% prepn. has a germicidal value about equal to pure PhOH. It can be applied beneficially to mucous membranes, without pain, and as a weak dressing for infected wounds; injected intravenously (1 cc.) into rabbits injected with *Staphylococcus aureus* it cured them within 24 hrs., while untreated controls died within 48 to 72 hrs. with multiple abscesses of liver, heart, etc. A. T. CAMERON

**The effect of hypophyseal extract upon water retention in the frog.** FRITZ BRUNN. *Z. ges. expth. Med.* 25, 170-5(1921).—The injection of pituitrin causes H<sub>2</sub>O retention in the frog. The mechanism differs from that in man in that it is due to extra-renal factors. E. B. FINK



The influence of alkalinity upon the activity of quinine alkaloids. L. MICHAELIS AND K. G. DERNBY. *Z. Immunität*, 34, 194-218(1922).—The bactericidal action of the quinine alkaloids rises with increasing  $p_H$ . The  $p_H$  of normal blood is not the max. but close to it. The  $p_H$  of tissues, the seat of inflammation, is far from the max. activity. The simplest explanation of this observation is that the free bases only are active and not the salts. Such observations may explain discrepancies between test-tube and animal expts. and in chemotherapeutic work observations should be made on the  $p_H$  of the solns. used.

E. B. FINK

The physiological action of the proteinogenous amines. V. The vegetative nervous system and metabolism. J. ABELIN. *Biochem. Z.* 129, 1-49(1922).—A study of the action of adrenaline, phenylethylamine, tyramine, thyroid substance, choline, acetylcholine, histamine, pilocarpine and atropine on the gas exchange of the white rat, and the effect of tyramine and phenylethylamine on the gas exchange of a thyroidectomized dog. All the compds. with the exception of histamine and acetylcholine increased the gas metabolism and frequently produced diuresis. Glycogen mobilization, hyperglucemia and glucosuria occurred. Tyramine and phenylethylamine are additive in their action on metabolism for when sub-effective doses of either are administered together with subeffective doses of thyroid substance there is produced a marked increase in gas exchange. These observations make it appear probable that the action of the thyroid on metabolism is only an expression of a generalized influence on the vegetative nervous system and that this is of great significance in the regulation of the kind and degree of total metabolism. The dose and the method of administration are important factors, for smaller doses are effective when the compds. are given orally. Histamine has no effect on the gas exchange, while acetylcholine produces a significant reduction.

F. S. HAMMETT

The caffeine concentration in blood and urine of rabbits after parenteral administration. L. F. LOEB. *Biochem. Z.* 129, 570-5(1922).—Using Friedberg's method for caffeine detn. (C. A. 15, 2891), L. found that of intravenously injected caffeine a part disappears from the blood stream in a few min. while the rest remains for some time. During the presence of this latter portion in the blood, caffeine excretion and diuresis take place. Subcutaneously injected caffeine is found in the blood and appears simultaneously in the urine. No definite time relations between blood and urine caffeine and diuresis could be established.

F. S. HAMMETT

The lethal dose of arsenic. G. JOACHIMOGLU. *Klin. Wochschr.* 1, 169(1922).—A young man swallowed about 1.4 g. of morphine chloride and 12 g. of  $As_2O_3$ . He lost consciousness within  $1\frac{1}{2}$  hr. A physician was not called until 12 hrs. later. The poison was not vomited. About 24 hrs. after the ingestion of the poison, the stomach was thoroughly flushed. Recovery was very slow, polyneuritis of the extremities developed and these symptoms did not subside completely until 9 months after the ingestion of the poison. This man's resistance to these poisons must have been unusually great because such a quantity of either morphine or As should have caused death. That the As was absorbed from the intestinal tract is proved by the fact that appreciable quantities of this element were found in the hair some 3 months after the poison was taken. The hair was free from As after 9 months.

MILTON HANKE

Chemotherapeutic experiments with "Bayer 205," a new trypanocidal agent of special activity. L. HAENDEL AND K. W. JOETTEN. *Berl. klin. Wochschr.* 57, ii, 821-3 (1920).—0.5 mg. of the agent causes the permanent disappearance of *Trypanosoma brucei* from mice, for which the lethal dose is 20 mg. Remarkable cures are also effected in the case of the dourine disease of horses. Some trypanosomes are not eliminated, for example, *T. lewisii*. Cf. the 2 following abstracts. J. C. S.

Experiments with a new trypanocidal agent ("Bayer 205") on trypanosomes

pathogenic to man and to animals. MARTIN MAYER AND HEINZ ZEISS. *Arch. Schiff-Tropen-Hyg.* 24, 257-94(1920); cf. preceding abstract.—The curative subcutaneous dose for mice is 0.06 mg., the lethal dose 10 mg. The substance is an unfailing therapeutic agent for mice, rats, guinea pigs, and rabbits infected with *T. brucei* (Nagana), *T. equiperdum*, *T. equinum*, *T. gambiense* (human sleeping sickness), and *T. rhodesiense*. Smaller doses have a prolonged prophylactic effect. J. C. S.

Action of "Bayer 205" on *Trypanosoma equiperdum* in experimentally infected mice. C. M. WENYON. *Brit. Med. J.* 1921, II, 746; cf. preceding abstract.—0.005 g. per kg. given intravenously frees mice from *T. equiperdum* in the course of 48 hrs. J. C. S.

The fate of foreign organic compounds in the animal body. CARL P. SHERWIN. *Physiol. Rev.* 2, 238-76(1922).—A general review. A bibliography of 107 references is appended. E. R. LONG

The effect of chlorophyll on heart action. KOICHI MIYADERA. *Berl. klin. Wochschr.* 58, 1159-60(1921).—Chlorophyll dissolved in olive oil produces a slight brachycardia in the heart of the frog. JULIAN H. LEWIS

Directions for the use of "Bayer 205" in trypanosome diseases. MARTIN MAYER. *Arch. Schiff-Tropen-Hyg.* 26, 33-7(1922).—Further observations of the new trypanosome curative "Bayer 205" in the blood. M. MAYER, H. ZEISS with GLEMSA AND HALBERKANN. *Ibid* 140-6.—By means of ultrafiltration and pptn. of the serum proteins it is shown that the active trypanosomocidal principle of "Bayer 205" is bound by the proteins, particularly by serum albumin. W. A. PERLZWEIG

Antimony in internal medicine. HANS SCHMIDT. Dresden. *Beihelle Arch. Schiff-Tropen-Hyg.* 26, No. 1, 7-68(1922).—An extensive review on the use of Sb in various tropical diseases of man and of animals. A large indexed bibliography is included. W. A. PERLZWEIG

The application of a water-soluble benzyl compound instead of papaverine. J. PAL. *Wiener klin. Wochschr.* 34, 435-6(1921).—A com. prepn., "Akincelon," which is used either as a Na or Ca salt of  $\text{COOH.C}_6\text{H}_4\text{CONHCH}_2\text{C}_6\text{H}_5$ , is described as a white cryst. substance, easily sol. in  $\text{H}_2\text{O}$  and alc. and stable on boiling in aq. soln. The Na salt was used in 25% aq. soln. for subcutaneous, intramuscular or intravenous injections, and the Ca salt was administered dry by mouth. Pharmacol. and clinical tests performed by P. show that this prepn. possesses the pharmacol. and therapeutic properties of papaverine, and also as being effective in replacing narcotine and emetine. W. A. PERLZWEIG

Action of opium upon the stomach. L. JARNO AND D. MARKO. *Wiener klin. Wochschr.* 34, 498-9(1921).—The emptying time of the human stomach is prolonged by opium irrespective of the degree of gastric acidity. The delayed motility of the stomach taken in conjunction with the increased tonus and active peristalsis is interpreted as signifying a contractive influence of opium upon the pylorus. W. A. P.

The propulsive force for the passage of fluid through the organism. II. Pressure of protein swelling and diuresis. Mode of action of caffeine as a diuretic. ALEXANDER ELLINGER, PAUL HEYMANN AND GEORG KLEIN. *Arch. expil. Path. Pharm.* 91, 1-36(1921).—Perfusion expts. in frogs with whole serum, serum dild. with Ringer soln., sugar solns., and gum solns. contg. caffeine, and ultrafiltration expts. indicate that the diuretic action of caffeine is to be ascribed to a phys.-chem. effect upon the serum proteins. This process is characterized by a decrease in the capacity of the serum proteins to take up water, thus leaving the fluid in a state where more can pass through the glomeruli. There is no evidence that caffeine exerts any direct stimulating effect upon the kidney cells. G. H. S.

Pharmacology and chemistry of the roe of the pike and barbel. F. H. MCCRUDDEN. *Arch. expil. Path. Pharm.* 91, 46-80(1921).—The toxic substance present in the roe of the pike is sol. in distd. water but is not dialyzable. It is pptd. by  $\text{Pb}(\text{OAc})_2$ , by satn. with

$(\text{NH}_4)_2\text{SO}_4$ , and by colloidal Fe. It is destroyed by heating for a short time at  $100^\circ$ . Unlike tetrodonin and tetrodonic acid it is not a simple cryst. compd., but appears to be of the nature of a protein, although not a globulin or protamine. Most probably it is an albumin or a substance, like the venoms, separable from the protein only with difficulty. In the dried substance there is 8-17% albumin. The lethal dose, per kg. of body wt., for rabbits is 0.02-0.04 g., and shows a high toxicity only when injected intravenously. Its chief action is upon the central nervous system, where it induces a paralysis of the respiratory center. It does not modify coagulation phenomena or possess a hemolytic activity. The toxic substance from the roe of the barbel has chem. and pharmacol. properties very similar to those possessed by the poison of the pike roe.

G. H. S.

**Pharmacology of the vessels. I. Action of poisons on the arteria pulmonalis and the arteria cutanea magna of Rana esculenta.** LEO ADLER. *Arch. expil. Path. Pharm.* 91, 81-109(1921).—In general the arteria pulmonalis and the arteria cutanea magna react in the same manner to perfusion fluids contg. various substances, although in some respects the response differs. In relatively high concns. adrenaline, histamine, tyramine, phenylethylamine, hordenine, and pituitrin cause constriction; with weak concns. a relaxation occurs. Hordenine is inactive in weak concn. upon the pulmonary artery and often in high concn. upon the cutanea magna. Peptone, papaverine, and narcotine in both high and low concns. cause dilatation of the pulmonalis.  $\text{BaCl}_2$  and  $\text{NaOH}$  always cause contraction. Peptone is without effect on the skin artery. Both arteries react the same to  $\text{HCl}$ , lactic acid, and  $\text{CO}_2$ , low concns. causing dilatation, higher concns. causing a constriction. The concn. of  $\text{HCl}$  which causes the greatest dilatations of the arteries is the same (0.001  $N$ ) as that which stimulates the respiratory center.

G. H. S.

**Antagonism of local anesthetics toward the veratrine effect in muscle.** J. SCHÜLLER AND F. ATHEMER. *Arch. expil. Path. Pharm.* 91, 125-9(1921).—Various local anesthetics—cocaine, novocaine, eucaine, stovaine, alypin, anesthesin, and orthoform—abolish the veratrine effect in striated muscle. The antagonism disappears spontaneously or it can be removed by perfusion. Cocaine also abolishes the veratrine action in curarized muscle. The mechanism of the antagonistic action is not clear.

G. H. S.

**Digitalis.** G. JOACHIMOGLU. *Arch. expil. Path. Pharm.* 91, 156-69(1921).—A tincture of digitalis of very high potency was held for a year under a variety of conditions and then re-tested. The sample held in a cellar in which the max. temp. was below  $18^\circ$  had not deteriorated at all. When kept at room temp. no loss occurred in 3 mos. but after a year the potency was reduced by about  $1/4$ , while that held at  $37^\circ$  lost rather more than  $1/2$  of its activity in a year. Samples to which  $\text{NaHCO}_3$  had been added lost almost  $1/4$  of their activity in a year. Exception is taken to the report of Sluyters that digitalis leaves contain substances toxic for frogs other than the heart-stimulating glucosides.

G. H. S.

**Antipyretics, opium alkaloids and salts as local anesthetics.** H. RHODE. *Arch. expil. Path. Pharm.* 91, 173-217(1921).—Many compds. including antipyretics, opium derivs., quinine, urethan, benzyl alc., and inorg. salts, were tested by injection into the skin of the forearm for their anesthetic effect. While many of the substances exert an antipyretic action and at the same time relieve pain, the 2 properties apparently have little in common, there being no parallelism in the intensities of the actions.

G. H. S.

**Blood concentration. I. Intravenous infusion of salt solution, with and without the addition of gum or gelatin.** W. NONNENBRUCH. *Arch. expil. Path. Pharm.* 91, 218-45(1921).—Changes in blood concn., as indicated by erythrocyte counts, serum proteins, and serum chlorides, were measured in rabbits after the intravenous infusion of 40 cc. of Ringer soln., or of Ringer soln. contg. 6% gum arabic or 5% gelatin. The

injections were followed in all cases by a transitory, but not marked, decrease in cell count, with the original count restored in about 2 hrs. Similar results followed the injection of rabbits whose kidneys had been removed. In order to induce a plethora of any considerable duration solns. contg. a high % of gum were required. The gum or gelatin somewhat inhibited diuresis. Changes in serum protein did not parallel the changes in red cell count, since immediately after the injection the serum protein showed a smaller reduction than did the red cells. No essential differences appeared which could be referred to the presence of colloid in the fluid injected as compared with pure Ringer soln. II. Effect of diuretics of the purine series upon the exchange of material between tissues and blood. *Ibid* 332-41.—The substances tested, theocine, theophylline, euphylline, as a rule had a marked influence on the exchange of material between tissues and the blood. The serum protein was particularly affected, *e. g.*, the serum protein (in %) of a rabbit was changed from 6.55 to 10.6 by the injection of 0.48 g. of euphylline. The changes in the red cell counts were less marked. Reactions of the same type occurred in animals deprived of their kidneys. Changes in serum chlorides were slight.

G. H. S.

Bile pigments and the quantitative relationship of bilirubin and cholesterol in the blood in various forms of icterus. F. ROSENTHAL AND K. MEIER. *Arch. expul. Path. Pharm.* 91, 246-71(1921).—Icterus neonatorum and expul. icterus (toluylenediamine, phenylhydrazine, and P poisoning) were studied from the point of view of the cholesterol content of the blood and the amt. of bile acids in the blood and urine. Icterus neonatorum, like hemolytic icterus and the icterus of pernicious anemia, is characterized by a markedly increased diazo reaction and by the lack of a cholesterolemia. Toluylenediamine icterus in dogs shows a positive direct diazo reaction and a considerable cholesterolemia; in cats the hypercholesterolemia is lacking. The extent of the blood icterus bears no relation to the degree of blood decompn. In rabbits no bilirubinemia occurs. Phenylhydrazine produces in dogs a very pronounced anemia but only a slight blood icterus. No cholesterolemia is present. In rabbits there is some lipidemia. This indicates some essential difference in lipid metabolism between herbivores and carnivores. P poisoning in dogs gives a quickly developed diazo reaction and an intense hypercholesterolemia.

G. H. S.

Effect of intra-arterial injection of adrenaline upon the arterial and venous blood pressure in man. FR. O. HUSS. *Arch. expul. Path. Pharm.* 91, 303-11(1921).—When adrenaline is injected intra-arterially the pulse almost completely disappears at the site of the injection, and the general reactions are lacking or are very slight.

G. H. S.

Galvanic irritability of human skeletal muscle after the intravenous introduction of concentrated calcium solutions. MARTIN NOTHMANN. *Arch. expul. Path. Pharm.* 91, 312-16(1921).—The intravenous injection of men with concd. Ca solns. (25 cc. of 10%  $\text{CaCl}_2$ ) markedly decreased the galvanic excitability of the muscles. This reaction appears within a few min. after the injection, reaches a max. within 15-20 min., and persists for about 1 hr. The strength of current necessary to produce stimulation is 2 to 3 times that normally required.

G. H. S.

Physiology and colloidal chemistry of the contracture of striated muscle induced by poisons. OTTO RIESSER AND S. M. NEUSCHLOSS. I. Acetylcholine contracture of frog muscle and the antagonistic effects of atropine, novocaine, and curare. OTTO RIESSER. *Arch. expul. Path. Pharm.* 91, 342-65(1921).—The contraction of the frog gastrocnemius induced by acetylcholine is inhibited or diminished by atropine, novocaine or curare, and in the case of curare the effect is not associated with a paralysis of the motor nerve endings.

G. H. S.

Relation of quinine and some of its derivatives to various hemolytic processes. JOHANNES BURMEISTER. *Arch. ges. Physiol. (Pflüger's)* 194, 182-94(1922).—Quinine

sulfate, quinine-HCl, euquinine, aristoquinine, optochin,  $\text{CaCl}_2$  and  $\text{NaCl}$  were tested for lytic activity on human and sheep erythrocytes. Only the optochin and the quinine sulfate showed a noticeable lytic action. These compds. were tested in conjunction with other lytic agents (acids,  $\text{CO}_2$ , amyl alc., thymol, saponin, hypotonic  $\text{NaCl}$ , and specific serum lysins). Acids inhibited, alkalies favored quinine hemolysis; likewise, quinine inhibited acid hemolysis and favored lysis by alkalies. Erythrocytes subjected to quinine are acid-susceptible.  $\text{CO}_2$  inhibits quinine hemolysis while quinine increases  $\text{CO}_2$  hemolysis. Quinine favors lysis by hypotonic solns., by thymol, and by saponin, but inhibits lysis due to amyl alc., and that induced by complement.

G. H. S.

Combined action of physostigmine and pilocarpine on the human eye. SOKI MARUI. *Klin. Monatsbl. Augenheilk.* 68, 145-52(1922).—The myotic action of a mixt. of physostigmine and pilocarpine was greater than was to be expected from a simple addition of the activities of the individual drugs.

G. H. S.

Combined action of atropine and cocaine on the human eye. INASABURO NAITO. *Klin. Monatsbl. Augenheilk.* 68, 153-60(1922).—The mydriatic action of atropine is greatly intensified by the addition of cocaine.

G. H. S.

Effect of the subcutaneous injection of salt solutions upon the chlorine and nitrogen of the blood and upon the temperature of infants. L. STOLTENBERG. *Z. Kinderheilk.* 30, 195-204(1921).—The subcutaneous injection of isotonic or hypertonic saline solns. in amts. of 40 to 90 cc. failed to produce any significant change in the Cl or N picture of the blood, or essentially to modify the temp. With hypotonic solns. an elevation of temp. occurred.

G. H. S.

Skin diseases caused by medicines. W. LUTZ. *Schweiz. Apoth. Ztg.* 60, 285-92 (1922).—The effects of gray ointment, I, Br, Hg, luminal, nirvanol, salvarsan, etc., also some phenomena of idiosyncrasy, are discussed.

S. WALDBOTT

Organotropic, bacteriotropic and leucocytotropic actions of certain organic chemicals. LLOYD D. FELTON AND KATHARINE M. DOUGHERTY. *J. Exptl. Med.* 36, 163-79(1922).—With certain members of the triphenylmethane dyes, and leuco bases, safranines, phenazines, quinones and cinchona groups there exists no consistent parallelism between the bacteriotropic activities and the organotropic and leucocytotropic activities. All the chemicals tested possess a leucocytotropic action, as measured by the decreased ability of leucocytes to ingest staphylococci. Four cinchona compds. (hydroquinine chloroacetylaniline-HCl, dihydroquinine *p*-chloroacetylamino-phenol-HCl, dihydroquinine *m*-chloroacetylamino-phenol-HCl and dihydroquinine 4-chloroacetylamino-pyrocatechol-HCl) and optochin are markedly antiphagocytic in their therapeutic doses. They possess a positive chemotactic action for leucocytes when injected into the peritoneal cavity of mice. In the case of *p*-methoxymalachite green, ethyl violet chloride, and diaminoacridine sulfate, the condition was approached in which the concn. of a non-lethal dose for mice is staphylocytotropic and not leucocytotropic.

C. J. WEST

Studies of chronic intoxications in albino rats. IV. Fluoride, chloride, and calcium (including sodium fluoride, sodium chloride, "phosphate rock," calcium phosphate (precipitated) and calcium carbonate (precipitated)). TORALD SOLLMANN, O. H. SCHETTLER AND N. C. WETZEL. *J. Pharmacol.* 17, 197-225(1921); cf. *C. A.* 15, 1574; 16, 968.— $\text{NaF}$  eaten with food during long periods in daily doses of 15 to 150 mg. per kg. of body wt. results in progressive impairment of growth and food consumption. The damage is proportional to the dose. It tends to outlast the administration of the drug so that the growth of animals poisoned with fluoride remains permanently below that of unpoisoned animals. The diminished food consumption is not due to distaste of the fluoride food. The effects are not due to "general salt action" for corresponding doses of  $\text{NaCl}$  are not harmful. Fluoride in the form of "phosphate rock" produces the same

effects as NaF and in nearly corresponding doses. The deleterious effect of phosphate rock is not shared by other insol. Ca salts in equal concn. No deleterious effects on growth or food consumption occurred in 9 weeks with daily doses of NaF of 8 mg. per kg. of body wt. or with smaller doses. VI. Lead carbonate. TORALD SOLLMANN. *Ibid.* 19, 375-91(1922).—0.0007 to 0.15 mg.  $PbCO_3$  per kg. wt. of rat produced slight but definite check of growth and appetite; the effect starts within 8 weeks and increases with the duration of feeding. No other definite symptoms occurred. Mortality was rather high between 9 and 17 weeks. Younger rats showed a higher resistance, growing and eating normally on doses of 0.3 to 1.22 mg. per kg. per day for 8 weeks. It is probable that these minute doses would also interfere with the nutrition and resistance of man, although they do not produce the clinical picture of plumbism. C. J. WEST

Coconut water, its characteristics, composition, and various uses (LAHILLER) 12.

HARE, HOBART AMORY: Text-book of Practical Therapeutics. 18th revised ed. New York: Lea & Febiger. 1033 pp. Reviewed in *Am. J. Med. Sci.* 164, 124 (1922).

# ZOOLOGY

R. A. GORTNER

The comparative morphology of the secondary sexual characters of Holocephali and elasmobranch fishes. V. W. H. LEIGH-SHARPE. *J. Morphology* 36, 221-43 (1922).—Secretion of the clasper gland of *Raja clavata* shows all the chem. and phys. properties of albumin. A. T. CAMERON

The influence of the hydrogen-ion concentration in the development of mosquito larvae. M. E. MACGREGOR. *Parasitology* 13, 348-51(1921); *Expt. Sta. Record* 46, 660.—The H-ion concn. has a profound effect upon the metabolism of mosquito larvae and their resistance to disease. H. G.

Variation of the osmotic pressure of the blood of Selachians under the influence of the modification of the salinity of the surrounding sea water. PAUL PORTER AND MARCEL DUVAL. *Compt. rend.* 174, 1493-5(1922); cf. *C. A.* 16, 2938.—Expts. were made with healthy specimens of *Scyllium canicula* weighing 300 to 400 g. After a sojourn of 2 to 6 hrs. in sea water dild. with fresh water or made more concd. by the addition of salts in varying proportions, about 3 cc. of blood was drawn from each, and the osmotic pressure of the blood detd. by the f.-p. method. The f. p. of the solns. in contact with the fish varied from  $-0.46^{\circ}$  to  $-4.0^{\circ}$ , that of the normal sea water in the aquarium being  $-2.08^{\circ}$ . The osmotic pressure of the blood is not always equal to that of the surrounding water, thus, with water freezing at  $-2.08^{\circ}$ , blood froze at  $-2.17^{\circ}$ . For concns. less than that of sea water the osmotic pressure of the blood diminished regularly but less rapidly than that of the medium. With concns. greater than that of sea water the osmotic pressure of the blood increased regularly but less rapidly than that of the medium but remained nearly constant at  $-2.5^{\circ}$  as the water varied from  $-3^{\circ}$  to  $-4^{\circ}$ . The fish presented a healthy appearance only with the water freezing between  $-1.07^{\circ}$  and  $-2.08^{\circ}$ . The tendency to regulate the osmotic pressure of the blood to meet changes of concn. in the surrounding medium is less marked in Selachians than in Teleostians, the latter being more highly organized. L. W. RIGGS

Constitution of the ovarian egg of the carp (*Cyprinus carpio*). E. FAURÉ-FREMIET AND MISS H. GARRAULT. *Compt. rend.* 174, 1495-8(1922); cf. *C. A.* 16, 2938.—The histologic and staining characters are described. Chem. analysis of the eggs gave  $H_2O$  66.3, proteins 25.7, fats 6.2, cholesterol 0.45, ash 2.0, sum 100.65. Details are given for the sepn. of the vitellin constituents, hyaline casts and ichitidine tablets. The fats consisted of phosphatides 12.33%, glycerides (by difference) 6.08, cholesterol 1.34, unsaponifiable residue 0.8. Carbohydrates were absent. The ash was largely

Ca and contained 1.2% of P. The combined amts. of P of the vitellins and lecithins subtracted from 1.2 leave 0.14% of P unaccounted for.  
L. W. RIGGS

**Origin of the natural coloration of silk in *Bombyx mori*.** CLEMENT VANEY AND JEAN PELOSSE. *Compt. rend.* 174, 1586-8(1922).—The coloring substances of the cocoon and of the blood are apparently identical and in alc. soln. give the same spectroscopic absorption band. This view is supported by the fact that with the strains producing white cocoons the young worms at the time of hatching have colorless blood. It appears that the color comes from the pigments in the leaves upon which the worms feed, and the variations in color depend on differences of permeability of the intestinal wall to these pigments. The blood of worms producing white cocoons contains much more tyrosinase than the blood of other strains. This enzyme according to its activity, may change varying amts. of the xanthophyllin pigments to colorless substances resulting in the various shades of pale yellow, greenish and yellow observed in raw silk.

L. W. RIGGS

**Animal chlorophyll: its relation to hemoglobin and to other animal pigments.** J. F. FULTON, JR. *Quart. J. Microscop. Sci.* 66, 339-96(1922).—The pigments of many animal species which lack a blood-vascular system were studied. Pigmented protozoa owe their color to an algal pigment which is the result of an outside infection. In the *Porifera* the pigment is chlorophyll, or a closely allied substance, derived from outside sources. The actinians manuf. their pigment from materials carried to the tissues by the gastro-vascular fluid, and these materials appear to be derived from the chlorophyllous substances of the food. The actinian pigments, aside from being chlorophyll derivs., are closely related to hemoglobin (actinohematin). Flat-worms may be colored by algal symbionts or by food pigments. The pigment (echinochrome) of the red cells of *Tripaneustes esculentus* is identical with the epidermis pigment and although probably not respiratory it bears a close chem. relation to hemoglobin. Since these red cells arise from the yellow cells—the chlorophylloid corpuscles—it appears that chlorophyll is capable not only of giving rise to animal pigment but indeed to one akin to hemoglobin (echinochrome breaks down into hemochromogen). It also appears that in many *echinoderms* there are three pigments present, chlorophyll, hematoporphyrin, and hemoglobin. Further, observations on several species (nudibranchs, annelids, crustaceans mollusca, tunicates, and insects) indicates that the various pigments—lipochromes, enterochlorophyll, etc.—are derived from the chlorophyll of the food. It appears most logical to conclude that many animals, and probably man, can utilize the four pyrrole groups of the chlorophyll mol. to synthesize hemoglobin and allied pigments.

G. H. S.

**Present-day melanism in the Lepidoptera. II. The physiological origin of large city melanism in the Hamburg moth *Cymatophora* or *F. aberration albingensis* Wm. K. HASEBROEK.** *Fermentforschung* 5, 297-333(1922); cf. *C. A.* 16, 295.—"Dopa" and tyrosine were the only compds. of a large number which formed melanin under suitable conditions. The large city melanism in question is due primarily to an increase of melanin precursors in the tissues. The ultimate cause is city fumes which reach the tissues through the tracheal system and there cause a disturbance in metabolism.

R. L. STEHLE

## 12—FOODS

W. D. BIGHLOW AND A. E. STEVENSON

**Progress in the canning industry in the last ten years.** W. D. BIGHLOW. *J. Ind. Eng. Chem.* 14, 793-4(1922).  
E. J. C.

**Relation of processing to the acidity of canned foods.** W. D. BIGELOW AND P. H. CATHCART. *National Canners Assoc. Bull.* 17L, 46 pp.(1921); *Exp. Sta. Record* 45, 181.—Tables give the  $p_H$  values, the source, the size of can and the time and temps. of processing of a large no. of canned fruits, vegetables and fish. As a general rule the greater the H-ion concn. the lower the temp. necessary for sterilization. Variations in heat penetration and in prepn. of the products cause exceptions to this rule. Graphs show the changes at stated intervals in H-ion concn. of several typical products during processing. Factors that influence this change are the heat of processing, which increases acidity; the addition of  $H_2O$ , sirup or brine, which tends to decrease acidity, diffusion, which tends to increase acidity in the case of foods canned alone or with the addition of  $H_2O$  sirups or brine and to decrease acidity is cases of the addition of acid liquor as tomato sauce. An explanation of  $p_H$  values and H-ion concn. is appended. Cf. C. A. 15, 127.

DOROTHY B. SCOTT

**Researches in regard to wheat, flour and bread.** C. E. SAUNDERS, R. W. NICHOLS AND P. R. COWAN. *Can. Expt. Farms Bull.* 97, 57 pp.(1921).—Results are given of exptl. work on methods of milling, baking, tests of baking strength of various wheats, the effect of common ingredients in breadmaking, the effect of storage on wheat and flour, action of bleaching on flour, the use of bread improvers, the effect of smut in flour on the stability of the gluten and the action of the yeast, the best percentage of flour to be extd. from wheat, bread made from gluten flour and some practical and useful hints on household breadmaking.

RUTH BUCHANAN

**Shortening the process of digestion in protein determinations of wheat and flour.** R. K. DURHAM. *Modern Miller* 49, No. 24, 26.—A series of detns. of nitrogen was made by the Kjeldahl-Gunning method on a sample of flour of unknown protein content. Forty minutes was found to be the minimum time for digestion. Expts. were made on the same flour by the same method as above but modified by the addition of 1, 2, 3, and 4 cc. of 60 %  $HClO_4$ . Best results were obtained by using 3 cc. of  $HClO_4$  and digesting 20 min.

RUTH BUCHANAN

**Some observations of corn meal in storage.** L. H. BAILEY AND C. THOM. *Oper. Miller* 25, No. 12, 368-71(1920).—Four lots of corn were selected and milled, one-half of each was bolted, the other half was whole cornmeal with nothing removed. Analysis showed that approx. 40 % of the bran was removed in the bolting process and this was the only difference. The percent moisture in the bolted and unbolted products were, resp., 16.62 and 16.22, 15.82 and 14.89, 13.89 and 14.17, and 12.86 and 12.5. Immediately after milling the meal was placed in bags, 100 lb. to the bag. The bags were piled 5 deep on heavy paper on a cement floor in a well ventilated galvanized iron building. The piles were arranged in two tiers. At the same time subsamples were placed in pint jars and kept in the lab. The bags of meal were held in storage from Apr. to Aug. 20, 1920. Samples were taken for analysis each week. Tables and charts show the results. There is a gradual decrease in moisture in all the samples stored in bags to approx. uniform content. The acidity increased with more or less regularity until about the middle of July. After 4 months' storage, none of the samples showed deterioration, even though half of the samples were unbolted. All were in marketable condition. The taste of the meal, especially the bolted was slightly sharper than that of the fresh meal, but muffins baked from the typical samples had no objectionable taste. The lab. samples showed a marked contrast on examn. and analysis. These results show that for this lot of corn there is a critical moisture content of about 13 %; above this spoilage is rapid unless the meal is kept under conditions of temp. and ventilation which will prevent the growth of microorganisms. This is effected by loss of water of the meal on prolonged storage.

RUTH BUCHANAN

**A biochemical reaction of "altered" corn meal.** J. VINTILESCO AND M. HAIMANN



*Bul. soc. chim. Romania* 4, 17-20(1922).—Corn meal exposed to direct or diffuse sunlight for a day turns the reagent of Vintilescu and Popesco (*C. A.* 10, 646) blue. Meal protected from light produces no color. The ether ext. of corn meal, treated in the same fashion, shows the same phenomenon. Since the extd. residue fails to show this reaction, it is to be attributed to the fat. The fat ext. "altered" by light shows a reduction of the I no. Whole wheat flour shows this reaction even when the reagent lacks hemoglobin. Finely milled wheat flour shows it in less degree. Wheat flour contains a direct oxidase not present in corn which contains a peroxidase and a catalase.

GEORGE ERIC SIMPSON

**Rapid method for the determination of fat in flour, bread, etc.** E. VAUTIER. *Mitt. Lebensm. Hyg.* 10, 40-4(1919); *Expt. Sta. Record* 45, 13.—For the rapid detn. of fat in cereal products, V. suggests heating for 5 min. at boiling temp. 1 g. of the thoroughly dried and powdered sample with HCl, 1 : 1, in special centrifuge tubes, adding a mixt. of equal parts of petroleum ether and ether, shaking for 5 min., centrifuging for 10 min., and finally decanting an aliquot of the clear liquid, evapng. the solvent and weighing the residue.

H. G.

**Determination of fats in cereal products, raw or cooked, and its application in determining flour grades.** B. R. JACOBS AND O. S. RASK. *Oper. Miller* 26, 35(1921); *Expt. Sta. Record* 45, 206-7.—In the method described 5 g. of the sample is digested in a 200-cc. Erlenmeyer flask for 2 min. on the steam bath with a mixt. of 10 cc. of 95 % alc., 2 cc. concd.  $\text{NH}_4\text{OH}$  and 3 cc. of water. After cooling, the contents of the flask are digested with 3 successive portions of  $\text{Et}_2\text{O}$ , after which the entire process is repeated. The combined ether exts. are evapd. to dryness on a steam bath, the fat is extd. from the residue with a mixt. of equal parts of ether and low boiling petroleum ether, and the exts. are collected in a tared beaker, evapd. to dryness on a steam bath, dried at 100° for an hr., cooled in a desiccator, and weighed. Data on the percentage of fat recovered by this and the direct ether-extn. methods indicate a greater recovery with the former method.

H. G.

**Keeping bread fresh.** J. SKILLIS. *Natuurwetenschapp. Tijdschr.* 4, 54-62(1922).—S. reports on the work done by J. R. Katz (*C. A.* 6, 2658; 7, 2073, 3169; 8, 2204; 9, 2275; 10, 1061; 15, 3153).

R. BEUTNER

**Rope (and sourness) in bread, together with a method of estg. heat-resistant spores in flour.** D. J. LOYD, A. B. CLARK AND E. D. MCCREA. *J. Hyg. (Cambridge)* 19, 380-83.—The skins of grains, all flours and all bread contain bacteria belonging to the group *B. mesentericus*. The cultural characteristics of 6 types of *B. mesentericus* isolated from grain and flour are given. Five of these were also obtained from ropy (or sour) bread. None of these 5 types can be identified as corresponding to organisms isolated by earlier workers on rope. Rope or sourness does not result from the presence of these bacteria unless conditions are such as to allow of great development. The factors detg. development of rope in bread are (1) degrees of infection, (2) moisture, (3) temp., (4) reaction, (5) compn. of flour.

RUTH BUCHANAN

**Maturing flours.** F. L. DUNLAP. *Chem. Met. Eng.* 27, 174-7(1922).—A résumé of the value of treating flour with Cl, to produce a product in which the H-ion concn. is such that the flour gives baking results similar to those of flours aged to their optimum point. Cl stabilizes the baking value of such flours for a prolonged period.

RUTH BUCHANAN

**Moisture determination.** M. E. SCHULZ. *J. Am. Assoc. Cereal Chem.* 7, 73-4 (1922).—Samples of flour placed in sealed metal containers were sent to 12 different labs. for the detn. of moisture. The results vary from 12.79 to 13.90. The three labs. which used a vacuum oven obtained 13.90. It is almost imperative that the cereal, lab. be equipped with a vacuum oven to insure more accurate results.

R. B.

**Report on baking powder.** L. H. BAILEY. *J. Assoc. Official Agr. Chem.* 5, 514-21(1922).—Collaborative results are given for the detn. of Pb in baking powder by the modified Chittick method and by the electrolytic method of Corper-Bryan, on the detn. of the neutralizing value of baking acids by 5 different methods and on the detn. of CO<sub>2</sub> by the C. S. Robinson method (cf. *C. A.* 16, 1813). The Chittick method of detg. lead is recommended for tentative adoption. RUTH BUCHANAN

**Fluorides in baking powder.** J. K. MORTON. *J. Assoc. Official Agr. Chem.* 5, 522-4(1922).—Consistent results could not be obtained on fluorspar, NaF or Na<sub>2</sub>SiF<sub>6</sub> with the Wagner-Ross method for F (*C. A.* 12, 29). Loss of F was traced to volatilization of HF before it can react with the SiO<sub>2</sub> in the digestion flask. CO<sub>2</sub> in the digestion flask gives rise to SO<sub>2</sub>, which passes through the chromic acid tube and gives high results. Presence of H<sub>2</sub>SO<sub>4</sub> in the tube where SiF<sub>4</sub> is collected must be tested for with BaCl<sub>2</sub> and correction made. Air can be used as a wash gas. As little as 0.005% F can be observed by the formation of a characteristic scum on the surface of the acid in the flask. The silicic acid formed at the point of contact of the gas delivery tube with the H<sub>2</sub>O indicates as little as 0.005% SiF<sub>4</sub> which comes over. A modified procedure is given applicable to baking powders giving greater recovery and more consistent results. H. A. L.

**Decomposition of hydrogen peroxide in the determination of the degree of bolting of flour.** D. MAROTTA AND R. KAMINKA. *Giorn. chim. ind. applicata* 4, 249-51(1922).—Shake 2 g. of the flour with 13 cc. H<sub>2</sub>O, add about 1 cc. 0.2 N Na borate to neutralize the acidity of the flour, and then 4 cc. of 8 vol. % H<sub>2</sub>O<sub>2</sub>. The app. used was a flask contg. a 2-holed stopper. The H<sub>2</sub>O<sub>2</sub> was added from a buret through one hole, while a delivery tube to carry away the O formed passed through the other hole. The O was collected and measured over water. The method does not indicate the degree of bolting of flour. But if values are obtained from the actual grain for various degrees of bolting, then these values may be used as criteria against the actual sample of flour from the same kind of grain. ROBERT S. POSMONTIER

**Report of progress on animal husbandry investigations in 1920.** J. W. GOWEN. *Maine Sta. Bull.* 299, 85-120(1921); *Expt. Sta. Record* 45, 877-8.—A compilation is included of the butter-fat percentage and percentage of total solids in the milk of various breeds. This is intended to be used as a basis for detg. what effect standardization to a definite fat percentage would have on the percentage of solids-not-fat. H. G.

**The manufacture of margarine.** HENRI BLIN. *Mat. grasses* 14, 6174-7(1922).—General description of the principle of the manuf. of margarine. A. P.-C.

**Report of committee on remade milk. III. Progress report of experiments for developing methods of detecting remade milk.** O. L. EVENSON. *Intern. Assoc. Dairy and Milk Insp. Ann. Rept.* 9, 45-67(1920); *N. Y. Prod. Rev. Am. Creamery* 52, 866-8(1921); *Expt. Sta. Record* 46, 176; cf. *C. A.* 16, 1815.—Brief reviews are given of methods of detecting mixts. of remade milk and natural milk reported in the literature and some tested in the Food Control Lab., of the U. S. Dept. of Agr. Tests discussed include H-ion concn., surface tension, rennet test, f.p. and mol. concn. const., sol. albumin, the nitrate test, and the rate of extn. of fat. The rennet test and the tests for nitrates are considered the most promising. H. G.

**The significance of surface tension for dairy practice.** OTTO RAHN. *Kolloid Z.* 30, 341-6(1922).—The accumulation of an albuminous substance which passes into the walls of the foam cells on the surface of skim milk as it leaves the cream separator reduces the surface tension causing the formation of the foam. This is in accordance with the Gibbs-Thomson theory. Left undisturbed, the foam falls leaving a thin wrinkled layer on the surface. If left to dry slowly, the foam cells cont. a solid substance. This drying is similar to that of many albuminous materials, in that it appears irreversible. This solid albuminous substance is probably the main component of the

skin which forms on milk heated to over 60°, and probably the cause of the easy burning of milk. When cream is whipped, the foam forms a network of solidified albuminous substance intermingled with solid fat having the form of the foam. The fat prevents the fall of the foam on standing. When warmed above its m. p., the fat collapses, but some froth remains because the albumin does not melt. The chem. nature of the foaming substance of milk has not been investigated as yet. It is certainly not identical with milk albumin and is not the casein. Cream used in making butter contains some of the foam-producing substance which surrounds the fat. On churning a large vol. of air is introduced, the surface is enlarged and the foaming substance rises to the surface, carrying the fat along. A foam rich in fat results above a liquid poor in fat (buttermilk). The surface pressure causes the fat globules, which lie close together to form conglomerates. The foaming substance solidifies gradually, and further churning breaks up the foam, mixing the fat conglomerates with the solid albuminous material to form butter. A discussion of the agreement of this theory with practice is given. H. A. I.

**Modified procedure for the determination of the "turbidity point" of butterfat.** ARMIN SEIDENBERG. *J. Assoc. Official Agr. Chem.* 5, 512-3 (1922).—A modification in detail only of original method (C. A. 12, 2028) is given which is more accurate and convenient but does not affect the consts. already established. The alc. should be accurately measured and contain about 1.5% H<sub>2</sub>O. Passage of air through alc. appears to have no particular advantage. Variation of the rate of suction affects the results considerably. In detg. the exact point at which turbidity can be considered present, the view should not be directly toward the light. H. A. I.

**Seasonal variation in butter-fat content of milk in southern Arizona.** R. W. CLOTHIER. *Proc. Soc. Prom. Agr. Sci.* 39, 75-112 (1919); *Expt. Sta. Record* 46, 679-80. —C. presents data on the monthly butter-fat % of the milk from 285 Arizona herds. Some seasonal variation is evident, the fat percentage being highest during January and lowest during March and April. The explanation of this is that the feeds differ at those times of the year. During the summer months the cows receive only alfalfa pasture, whereas during the winter months they receive alfalfa hay and barley pasture. An expt. is also cited in which the butter-fat % in milk was raised from 2.98 to 3.48 % by feeding cottonseed meal. Since these results are contradictory to much exptl. evidence, C. thoroughly reviews and discusses the literature dealing with the possibilities of varying the fat percentage in milk by the feeding of different feeds. A bibliography of 100 references is included. H. G.

**To determine pasteurization.** M. GRIMES. *N. Y. Prod. Rev. and Am. Creamery* 50, 814-17 (1920); *Expt. Sta. Record* 44, 777. —G. reports an investigation of the Storch test for heated milk at the Ontario Agricultural College. After a study of different concns. of the reagents, it was concluded that a 0.5 % soln. of the H<sub>2</sub>O<sub>2</sub> and a 0.2 % soln. (freshly mixed) of the *p*-phenylenediamine gave the sharpest reaction when 1 cc. of each was used with 10 cc. of the milk to be tested. Fresh milk heated above 172° F. gave a decided negative reaction, and it was found that admixt. of less than 4 % of raw milk with the heated milk did not affect the test. Cream heated to 150° in 32 min. and held at that temp. for 20 min. remained positive throughout. Cream samples heated to 150° more rapidly (25 min. or less) with the temp. allowed to go higher (about 160°) before cooling gave negative reactions. Cream heated to 160° in 15 min. reacted negatively without further holding. Butter made from cream samples that reacted negatively also gave negative tests. The KI-starch test was found not to give consistent results for temps. between 160 and 180°. H. G.

**Storch pasteurization test.** M. GRIMES. *N. Y. Prod. Rev. and Am. Creamery* 51, 592 pp. (1921); *Expt. Sta. Record* 44, 777. —Continuing previous work (cf. preceding abstr.), G. reports that a high degree of acidity (about 0.42 % lactic acid) in milk or

butter causes raw milk and butter made from raw cream to give a negative reaction to the Storch test. A modification of the test is therefore proposed, in which the sample is neutralized by NaOH before the  $H_2O_2$  is added. H. G.

The moisture content of dried milk. GEO. E. HOLM. *J. Assoc. Official Agr. Chem.* 5, 509-11(1922).—Expts. show that heating dried milk for 1 hour at  $100^\circ$  in a partial vacuum (25 in.) gives reliable results. Samples should be shipped in tightly sealed glass or metal containers since dried milk absorbs  $H_2O$  readily. D. B. S.

Cryoscopy of milk. E. M. BAILEY. *J. Assoc. Official Agr. Chem.* 5, 484-97(1922).—Results by the Hortvet method for the f. p. of milk obtained by collaborators on 216 samples are tabulated. Conclusions are drawn from these results and those obtained in 1920 (*C. A.* 15, 1359). The samples represent 179 from normal cows, 61 from normal herds (normal being animal or herd classed as healthy by the dairyman not pronounced sound by experts on clinical tests), 37 from diseased or otherwise abnormal cows, 3 from diseased herds, and 11 unclassified. The results indicate that: (1) There is an appreciable and often conspicuous diff. in f. p. depression between morning and evening milk the variation being greater than that between same milks on successive days. (2) The min. f. p. depression of  $0.530^\circ$  and max. of  $0.566^\circ$  for milk of normal individual cows and the min. of  $0.530^\circ$  and max. of  $0.562^\circ$  for normal herds are reasonably substantiated. (3) The results of moderate exercise or moderately delayed milking are not reflected in the f. p. depression; long delayed milkings, 9.5-10.5 hrs., may or may not be followed by depressions, while severe exercise, strain or fatigue is followed by materially increased depressions. (4) The milk from tubercular cows or those in otherwise poor or abnormal condition has generally fallen within the limits for normal f. p. with a few exceptions in the direction of decreased depressions. (5) Study should be made on the extremely low f. p. observed on some samples of morning milk; on the correction factor of Keister (*C. A.* 11, 2832) for the effect of increased acidity on f. p. depression with a view to corroborating or modifying it; and continued on the effect of pathological conditions on the f. p.

HENRY A. LEPPER

The cryoscopic examination of milk. JULIUS HORTVET. *J. Assoc. Official Agr. Chem.* 5, 470-84(1922).—Study was undertaken on standardization of the thermometer used on milk samples of cows and herds under pathologic disturbance, unusual physical strain or under abnormal conditions of housing and feeding, and on samples mixed with known amts. of  $H_2O$ . The results of collaborators are given and discussed. The cryoscopic method essentially involves the procedure for testing and correcting the thermometer and the procedure of making the freezing point detn., strict attention being given to (a) temp. of the cooling bath, (b) the degree of supercooling and (c) a close adherence to quantity of the sample, rate of stirring and method of using the thermometer. The method (*C. A.* 15, 1359) is recommended for official adoption. *Cf. C. A.* 15, 3882.

HENRY A. LEPPER

Determination of fat in malted milk. J. T. KEISTER. *J. Assoc. Official Agr. Chem.* 5, 507-9(1922).—The neutral method (*C. A.* 16, 1815) exts. the fat in malted milk more completely than the official Rose-Gottlieb method. D. B. S.

Factors influencing coagulation temperature in evaporated milk. L. A. ROGERS. *Canner* 52, 165, 166(1921); *Expt. Sta. Record* 45, 111.—R. discusses the conclusion drawn by Sommer and Hart (*C. A.* 14, 985) that the chief factor in the heat coagulation of fresh milk is the compn. of the milk salts. He shows that, while this may be true of fresh milk from individual cows, in herd milk other factors enter which have so great an influence on the curdling temp. that the effect of the compn. of the salts is almost entirely obscured. Of these factors the most important is considered to be the growth of bacteria not only of acid-forming types but of types which produce a rennin or milk-curdling enzyme without increasing the acidity of the milk. Expts. are cited. H. G.

**The determination of the dirty sediment in milk.** A. R. TANKARD. *Brit. Food J.* **24**, 51-3(1922).—About 500 cc. of milk with 1 cc. 40% formalin soln. is let stand in a tapered cylinder. The small end of the cylinder fits by a ground joint into a small tube, the lower end of which is constricted and graduated into 20 divisions of 0.01 cc. each. After 24 hrs., the lower opening at end of the taper is closed by a rubber stopper on the end of a glass tube, the lower tube is removed and centrifugalized 5 min. at 2000 r. p. m. The milk is poured off, the sediment is washed with  $\text{Na}_2\text{CO}_3$  soln. by stirring and centrifugalizing. Washing is repeated until milk is removed, and the vol. of moist sediment is then recorded. A generous limit is 2 parts moist sediment per 100,000, which should be free from dung. Most samples examd. run less than 1 part. A special stand is described to hold a no. of cylinders.

HENRY A. LEPPE

**Babcock testing of milk and cream.** C. F. HORT. *Calif. Dept. Agr. Mo. Bull.* **9**, 542, 543(1920); *Expt. Sta. Record* **44**, 805.—A method devised by O. G. Simpson for calibrating Babcock test bottles is described, with an illustration of the apparatus employed.

H. G.

**The chemistry of cream.** A. BURR AND C. LINDEMANN. *Molk. Ztg. (Hildesheim)* **35**, 1229, 1230, 1257, 1258, 1273, 1274, 1305, 1306(1921); *Expt. Sta. Record* **46**, 275.—The authors report chem. analyses of a large no. of samples of cream and review the literature concerning the compn. of Devonshire clotted cream, powd. cream, cream cheese, etc., the object being partly to det. the influence of added water on the chem. compn. of cream and partly to compare the cream products with whole milk.

H. G.

**The neutralization of cream—mixed lime and sodium bicarbonate as an agent.** L. T. MACINNES. *Agr. Gaz. N. S. Wales* **32**, No. 2, 113, 114; *N. Y. Prod. Rev. Am. Creamery* **51**, No. 22, 1168(1921); *Expt. Sta. Record* **45**, 779.—M. reports success in mfg. butter from high acid cream neutralized with equal parts of lime and  $\text{NaHCO}_3$  and then pasteurized. Both the holding and the flash methods of pasteurization were employed. With the former the viscosity was found to be less than when lime alone is used, and with the latter there was less froth than when soda was used alone.

H. G.

**Neutralization of cream. Rate and amount of the reaction in flash and batch (or holding) pasteurizers.** A. A. RAMSAY. *N. S. Wales Dept. Agr., Sci. Bull.* **17**, 22 pp.(1920); *Expt. Sta. Record* **45**, 880.—Lab. and factory expts. are reported continuing the work of O'Callaghan and Ramsay (*C. A.* **12**, 1220). The mixing of cream and neutralizing agent was more rapid and uniform with the flash method of pasteurization than with the holding method. Wide differences were found in the efficiency of holding plants in actual use in creameries. In using  $\text{NaHCO}_3$  with the flash system there appeared to be a slightly greater reduction in acidity than was expected by theory. On the other hand, the actual reduction in acidity by lime was less than the computed.

H. G.

**Neutralization of overripe milk for cheese making.** J. G. McMILLAN. *N. S. Wales Dept. Agr., Farmers' Bull.* **136**, 20 pp., abridged in *Agr. Gaz., N. S. Wales* **32**, No. 1, 35-41(1921).—Reports are given of various expts. in mfg. cheese from neutralized sour milk. The treatments are designed for emergencies and are not such as would be used under normal conditions. The neutralization of high acid milk to a normal degree of acidity by means of  $\text{NaOH}$ , lime water being used in the whey, was found to produce a good marketable cheese in the wintertime. Free lime was found to decompose the protein with the production of  $\text{NH}_3$ . In the summer time neutralization with  $\text{NaOH}$ , followed by pasteurization and treatment with  $\text{CaCl}_2$  to restore the coagulating properties lost by heating, did not in general produce a satisfactory cheese. When, however, only the evening milk was thus treated and was mixed with the raw morning milk, better results were obtained. When the milk was only moderately acid, rapid mfg. methods involving relatively high temp. and extra rennet proved more satisfactory than any of the neutralization methods tested.

H. G.

**Report on the determination of moisture in cheese.** L. C. MITCHELL. *J. Assoc. Official Agr. Chem.* 5, 498-506(1922).—Tables show the effect on H<sub>2</sub>O detn. in cheese of type of oven used, time of drying, temp., pressure, size of drying dish used, the presence or absence of porous material (such as asbestos or sand), wt. of samples used, number of samples dried, position of the sample in the oven (with certain types of ovens), current of air. Cheese is dried most favorably and quickly in a large dish when the sample is mixed with sand (10-15 g.), or asbestos (2-3 g.) and kept at the temp. of the b. p. of H<sub>2</sub>O at atm. pressure or in a high vacuum (26-27 in.). DOROTHY B. SCOTT

**The composition of different kinds of cheese.** A. BURR, M. STEFFEN AND C. LINDEMANN. *Molk. Ztg. (Hildesheim)* 35, 727, 728, 743, 744, 775, 776(1921); *Expt. Sta. Record* 46, 276.—The authors report chem. analyses of numerous samples. Notes on methods of mfg. are given in some cases. H. G.

**Cheese experiments.** *Ontario Agr. Col. Expt. Farm. Ann. Rept.* 45, 25-7(1919); *Expt. Sta. Record* 46, 680-1.—The following expts. are reported: rennet vs. mixtures of rennet and pepsin. The cheese made with rennet (3 oz. per 1,000 lbs. of milk) scored slightly higher than cheese made with rennet and pepsin (1.5 oz. of rennet and 2 oz. of pepsin). Effect of acidity of milk on rennet and pepsin solutions. Tests were made with milk of 0.18 and 0.19 % acidity. The higher acidity favored more rapid coagulation, but was not any better for the pepsin than for the rennet soln. as detd. by the yield and the quality of the cheese. Effect of increased temperature of the milk at the time of adding rennet and pepsin. In milk averaging 0.19 % acidity, 3 oz. of rennet to 1,000 lbs. of milk at 86° F. averaged 88.66 lbs. of cheese, whereas 2.5 oz. of rennet to 1,000 lbs. of milk at 90° averaged 89.02 lbs. of cheese. Effect of paraffining cheese on shrinkage and quality, held in ordinary curing room and ice-cold storage. Less wt. was lost by cheese in storage which had been paraffined than by similar cheese in storage which had not been paraffined. The av. score of the paraffined cheese was a little higher except in case of the small flat cheese kept in ice storage, when the reverse was true. H. G.

**Studies on the determination of the egg content of food materials by means of the precipitin reaction.** J. THONI. *Mitt. Lebensm. Hyg.* 10, 1-26(1919); *Expt. Sta. Record* 45, 13.—A study is reported of the accuracy of the precipitin reaction with egg white and egg yolk in the fresh and dried state, which shows that the method can be used for the quant. detn. of both in the fresh state, but that in dry and old products it is suitable only for egg white prepn. The technic of the method as applied to the detn. of the latter is described in detail. H. G.

**Coconut water, its characteristics, composition and various uses.** A. LAHILLE. *Bul. écon. Indochine, n. ser.* 23, No. 140, 1-25(1920); *Expt. Sta. Record* 45, 507.—Analyses are reported of coconut water. Its use as an adulterant of milk and medicinally as a diuretic are discussed. K is believed to occur in the milk as KNO<sub>3</sub> and KCl. Contrary to the results of de Kruyff (*C. A.* 2, 555), sucrose was not found in the juice of the young nuts, only reducing sugars were found. H. G.

**Methods used in manufacturing unfermented grape juice.** C. H. CAMPBELL. *Canner* 51, No. 9, 35, 36; No. 10, 35, 36(1920); *Expt. Sta. Record* 45, 210.—A brief description is given of the various steps in the process of mfg. Concord grape juice, together with analyses of juices from Concord, Ives, and Clinton grapes, of argol, and of grape pomace. H. G.

**Cider and its preservation.** F. E. RICE AND A. L. MARKLEY. *N. Y. Agr. Coll. (Cornell) Expt. Bull.* 44, 23 pp.(1921); *Expt. Sta. Record* 46, 207-8.—A discussion of the chem. compn. and food value of apple cider, and the most practical methods for its prepn., clarification, preservation, and concn. H. G.

**The valuation of marmalades, particularly the determination of sugar content.** H. SZARGA. *Z. offenl. Chem.* 26, 186-8, 194-9(1920); *Expt. Sta. Record* 45, 615.—

Methods for the analysis of com. marmalades for the detection of adulteration and misbranding are discussed, with exptl. data. H. G.

The detection of apple juice in "pure fruit" jams. C. F. MURRELET. *Ann. fals.* 15, 196-200(1922).—The acidity of gooseberry, black currant, raspberry and strawberry juices is due to citric acid, and that of cherry juice to malic acid (cf. *C. A.* 3, 2716). The acidity of apple, pear, and quince juices is due to malic acid (details to be published later). To detect apple juice in gooseberry, black currant, raspberry or strawberry jams, det. the malic acid by the following method. Mix 100 g. of the jam with 50 cc. of water in a porcelain dish on the water-bath, transfer to a 300-cc. volumetric flask, leave in the water-bath with frequent shaking till all sol. material is dissolved, cool, gradually add 150 cc. of 95% alc. with stirring, make up to vol. with water, shake, let stand a few hours, and filter. If the filtrate is highly colored, treat with 3-4 g. of char free from alk. earth salts and filter after 15-20 min. Titrate the acidity with 0.1 N KOH and phenolphthalein in 20 cc. of the filtrate dild. to 100 cc. To 100 cc. of the filtrate add 200 cc. of 95% alc., neutralize with N KOH, and add 25-30 cc. of 5% BaBr<sub>2</sub> in 85% alc. Let stand a few hours, filter, and wash the ppt. with 80% alc. till free from Ba. Transfer to an Erlenmeyer flask, digest with water on the water-bath for about an hour, cool, filter, dild. to about 100 cc., slowly add 50 cc. of alc. with stirring, and filter off the Ba citrate. Conc. the filtrate to 50 cc., cool, add 25 cc. of alc., and filter off the last traces of Ba citrate. Conc. the filtrate on the water-bath to 25 cc., filter if necessary, add two vols. of alc., filter off the Ba malate, and wash with a mixt. of 1 part of water to 2 of alc. The dils. and pptns. should all be made at about 15°. Dissolve the Ba malate in water, ppt. with H<sub>2</sub>SO<sub>4</sub>, and weigh as BaSO<sub>4</sub>. BaSO<sub>4</sub> × 0.574 = malic acid. Results obtained by this method on home-made gooseberry jellies, com. raspberry, gooseberry, apple and quince jellies, and mixts. of the latter show that the addition of apple or quince can be readily detected. A. P.-C.

Pectin studies. (Gl. Brit.) Dept. Sci. Ind. Research, Food Invest. Board Rept. 1920, 22-24; Expt. Sta. Record 46, 207.—In the progress report for 1920 of the fruit and vegetable comm. of the Food Investigation Board, Great Britain, it is noted that the juice of apples kept in cold storage or in CO<sub>2</sub> storage contains markedly less pectin than the juice of apples in ordinary storage; also that unripe gooseberries after standing in open vessels for some days show a considerable increase in pectin content compared with ungathered fruit, but that the normal increase in pectin is lessened by mincing the tissue and covering with water, by coating the berries with vaseline, or by storage in an air-tight vessel. Evidence is presented that more pectin can be obtained from fruit tissue by the action of heat and acid than is originally present in the sol. state. In quant. estn. of the amts. of sol. pectin obtained from fresh and dried apple tissue by successive extns. with cold water, hot water, or steam under pressure, and hot dil. acid, it was found that the amt. of pectin obtained by the action of steam under pressure was considerably greater than that obtained by heating with water, and almost as much as that obtained by the action of hot acid. H. G.

Relation of pectin and acidity in jelly making. LAL SINGH. *J. Ind. Eng. Chem.* 14, 710-11(1922).—A study of the effects of acid and pectin concns. in making jelly. It is possible to prep. a jelly from pectin, acid, sugar and H<sub>2</sub>O even if the mixt. is deficient in acid. There is a definite relation between the amounts of acid present and sugar necessary to form jelly. Between certain limits, the greater the acidity the lower the amt. of sugar required. Also the greater the amt. of pectin, the lower the amt. of sugar. By increasing the pectin from 0.9 to 1.5% in a juice over 15% of sugar can be saved. After a certain concn. of pectin in a jelly the excess remains inactive. A jelly with sugar content below 65% must be pasteurized. Lemon peels which go to waste at citric acid factories would yield 90 lbs. of pectin per ton of peel. H. A. L.

**Solanine and its occurrence in potatoes and potato skins, with special reference to the poisoning question.** J. HANSEN. *Z. expl. Path. Ther.* 20, No. 3, 385-437(1919); *Expt. Sta. Record* 45, 862.—An historical review of the literature on solanine, including its occurrence, chem. properties and biological action, and reported cases of solanine poisoning. This is followed by the report of chem. and biological studies conducted by H. leading to the conclusion that the alleged solanine poisoning from potatoes cannot be attributed to solanine, but to some form of bacterial toxin. The evidence leading to this conclusion is that in the gastrointestinal tract solanine undergoes hydrolysis with the formation of solanidine, which is practically insol. and consequently not absorbed into the blood stream. Detns. of solanine in potatoes showed a content of 1.44% in dried sprouts from 4 to 7 cm. long. Dried skins from fresh potatoes gave an av. of 0.115% solanine and from cooked potatoes 0.165%. H. G.

**Indo-Chinese manioc rich in nitrogen.** P. AMMANN. *Compt. rend.* 170, 1333-4 (1920); *Expt. Sta. Record* 44, 825.—Comparative analyses are given of manioc from different localities, showing in certain new varieties from Indo-China a high N content associated with a low content of HCN. H. G.

**Some factors affecting the quality of ripe olives sterilized at high temperatures.** W. V. CRUESS. *Calif. Agr. Expt. Sta., Bull.* 333, 221-31(1921).—Storage of olives in a strong brine for several days followed by canning in very dil. brine or water makes the texture of the fruit firmer. Acidified brines act vigorously upon the tin plate and impart an undesirable flavor to the fruit. The color of olives is retained more satisfactorily in lacquered than plain cans. The best product is obtained when sterilized at 240° F. for several min. Very ripe fruit is more subject to damage in flavor than less mature fruit at this temp. J. J. SKINNER

**Dehydration of fruits.** W. V. CRUESS AND A. W. CHRISTIE. *Calif. Agr. Expt. Sta., Bull.* 330, 50-77(1921).—Tested methods of prepn. and conditions of dehydration recommended for various fruits are given. Those recommended apply to the air-blast tunnel type of dehydration, which has proved the most satisfactory type for general fruit dehydration. Cf. C. A. 15, 1045. J. J. SKINNER

**The determination of starch in sausage and meat pastes.** G. AMBÜHL AND H. WEISS. *Mitt. Lebensm. Hyg.* 13, 170-5(1922).—Identify the kind of starch present by the microscope. Ext. the fat from a 5-g. sample with 2 treatments of 10 cc. alc. and 50 cc. Et<sub>2</sub>O by rubbing in a casserole with a pestle. Remove the last traces of solvents by air blast or oven at 100°. Rub with 10 cc. H<sub>2</sub>O and 50 cc. CaCl<sub>2</sub> soln. (1 part anhyd. CaCl<sub>2</sub> to 1 part H<sub>2</sub>O) and boil for 10 min. If the CaCl<sub>2</sub> soln. is pink to phenolphthalein neutralize with AcOH before using. Transfer to a 100-cc. flask with hot H<sub>2</sub>O, complete the vol. and filter. At the same time prep. a similar soln. from 0.1 g. of the same type of starch as that in the sample. To 10 cc. of standard and sample solns. add 1 cc. of 0.05 N I. Centrifuge at 1200-1400 r. p. m. The starch-I ppt. should be well settled and supernatant liquid should be clear and yellow, showing enough I to be present. With materials rich in glycogen (those contg. liver) a large excess of I is to be avoided. With heavily cooked, or bread-contg. wares, the liquid may be brown because of dextrin. Results are calcd. by comparing the quantities of ppts. For colorimetric comparison 10 cc. of each starch soln. is dild. to 100 cc. and I soln. added until deepest blue is reached. HENRY A. LEPPER

**Hypochlorite process of oyster purification. Report on experimental purification of polluted oysters, on a commercial scale by floating them in sea water treated with bleaching powder.** F. A. CARMELIA. *Pub. Health Repts.* 36, 876-83(1921); *Expt. Sta. Record* 45, 561.—Oysters (60-150 bu.) from the polluted water of Great Kills Harbor were floated in sea water contg. enough CaOCl<sub>2</sub> to give 4-6 parts per million of available free Cl. After 6 hours the same treatment was repeated and the treated water allowed



to remain undisturbed for 12 to 18 hrs.; then the oysters were removed. A table shows the bacterial results. When the oysters score 50 or more, an av. 90% reduction of the *B. coli* content is obtained. The application of this process is feasible and desirable on a large or small scale if properly supervised.

DOROTHY B. SCOTT

Further investigations and observations on the value of the ammoniacal copper oxide method for the valuation of feeding stuffs. F. MACH. *Landw. Vers. Sta.* 95, 89-100(1919); *Expt. Sta. Record* 45, 616.—Further data are reported of the application to feeding stuffs of the method distinguishing between raw and crude cellulose (C. A. 15, 2982). Additional directions are given for the prepn. of the cellulose solvent and for the simultaneous estn. of the insol. crude fiber and the sol. crude cellulose. In the former 100 g. of twice or thrice recrystd. Cu sulfate is dissolved in 500 cc. of hot water made slightly alk. with  $\text{NH}_4\text{OH}$  and heated until it no longer smells of  $\text{NH}_3$ , after which it is decanted six or eight times with hot water, and finally filtered on an asbestos plate and washed with water until the filtrate is almost acid-free. The ppt. is transferred to a flask, dissolved in 2 l. of concd.  $\text{NH}_4\text{OH}$  (sp. gr. 0.925), and filtered through asbestos. In detg. insol. crude fiber and sol. crude cellulose 3 g. of the sample, rendered fat-free with acetone, is shaken in a flask for 2 hrs. with 300 cc. of the ammoniacal Cu soln., made up to 500 cc. with concd.  $\text{NH}_4\text{OH}$ , mixed, filtered on an asbestos filter, and dried after washing with acetone. The funnel is then placed in the suction flask and the entire contents of the shaking flask are brought on to the filter, which is finally washed with ammonia and water. For detg. the sol. cellulose in the filtrate 50 cc. of the soln. is shaken in a shaking flask for 30 min. with 100 cc. of 90% alc., added drop by drop, and finally with 25 cc. of concd.  $\text{AcOH}$ , the ppt. filtered on an asbestos plate, washed with hot water and acetone, and brought to const. wt.

H. G.

Digestibility of fodders. J. C. BRUNNICH AND V. S. RAWSON. *Queensland Agr. J.* 15, No. 5, 195-8; No. 6, 235-9(1921); *Expt. Sta. Record* 45, 468.—The authors fed 4 wethers during 12 feeding periods of 12 days each and detd. the digestion coeffs. tabulated below:

Compn. and digestibility of Australian feeding stuffs.

Feed.	Compn.					Digestibility (sheep).					
	Org. mat- ter.	Crude pro- tein.	Ether ext.	Crude fiber.	N-free ext.	Org. mat- ter.	Crude pro- tein.	Ether ext.	Crude fiber.	N-free ext.	Starch value.
	%.	%.	%.	%.	%.	%.	%.	%.	%.	%.	%.
Alfalfa hay	80.96	15.95	1.40	25.40	38.21	71.5	80.4	47.1	65.0	73.3	39.73
Bush hay—											
poor . . . .	78.21	2.95	0.77	34.55	39.94	55.3	15.5	33.5	62.8	52.9	23.42
Mitchell											
grass hay	76.86	3.63	1.04	42.45	29.74	47.5	17.5	39.6	60.5	32.8	13.75
Corn and mill-											
let silage	27.90	1.44	0.59	9.77	16.10	60.1	22.9	60.9	61.0	63.2	12.53
Wheat bran	84.29	14.26	4.48	9.84	55.71	73.6	80.1	59.7	37.0	79.6	48.86
Shorts (pol-											
lard) . . . .	86.40	14.70	4.26	5.31	62.13	77.3	78.9	74.1	40.5	80.2	68.12
Corn meal..	85.28	8.67	3.65	2.03	71.03	81.1	59.9	84.1	55.1	84.3	71.84
Coarse dried											
blood . . . .	82.98	78.75	1.88	.....	2.35	62.8	60.8	100.0	.....	100.0	50.60
Fine blood											
meal . . . .	80.77	71.40	3.39	.....	5.98	88.0	89.0	89.90	.....	75.9	68.19

Comparisons are made throughout with results obtained in Germany and in the United States. The digestibility of the crude fiber of feeds grown in Australia was found re-

lately high, due it is suggested, to the rapid growth plants make in that country. The coeffs. for protein and fat tend to be lower than those detd. elsewhere, and in connection with the lower digestibility of the protein it is noted that Hawkesworth states that the N content of Australian wool is about 2% lower than that of English wool.

H. G.

**Comparative determination of the digestibility and metabolizable energy of green oats and tares, oat and tare hay and oat and tare silage.** H. E. WOODMAN. *J. Agr. Sci.* 12, 144-65(1922).—Digestion coeffs. in % for green oats and tares, oat and tare hay, and oat and tare silage, resp., are: dry matter 63.7, 65.0, 64.1; org. matter 65.5, 66.1, 65.9; crude protein (apparent) 63.1, 68.2, 65.1; crude protein (corrected) 82.5, 84.1, 83.7; ether ext. 51.9, 36.8, 73.4; N-free extractives 76.5, 71.3, 70.5; crude fiber 47.6, 58.7, 57.1; ash 42.2, 53.6, 43.7.

R. B. DREMER

**Composition of silage.** A. J. PATTEN. *Michigan Sta. Quart. Bull.* 3, No. 4, 142 pp. (1921); *Expt. Sta. Record* 45, 671.—The following analyses of silage are reported:

*Chemical composition of four kinds of silage.*

Kind of silage.	No. of samples.	Moisture. %.	Crude protein. %.	Ether ext. %.	Crude fiber. %.	N-free ext. %.	Ash. %.
Corn .....	12	72.35	2.52	0.82	6.20	16.93	1.13
Corn stover.....	2	77.84	1.55	0.40	7.55	11.61	1.06
Sunflower.....	2	76.35	2.66	0.84	7.14	11.16	1.85
Sugar beet tops (pit silo) ..	1	76.12	3.38	0.49	2.24	8.06	9.71

H. G.

**The composition and feeding value of silage.** *J. Mining Agr.* (London) 27, No. 3, 277-81(1920); *Expt. Sta. Record* 45, 374.—Proximate analyses by G. WILLIAMS are reported of single-crop silages made from clover, corn, grass, and Trifolium, and the following types of mixed silage: (1) grass, tares, and oats; (2) tares and oats; (3) tares, wheat, and oats; (4) tares, oats, rye, and marsh grass; (5) tares, oats, rye, beans, and wheat; and (6) rye, oats, and tares.

H. G.

**Good and bad sunflower silage.** F. L. BALLARD. *Hoar's Dairyman* 62, No. 5, 128 pp.(1921); *Expt. Sta. Record* 45, 577.—Analyses are given of samples of the silage collected in three sections of Oregon. On the coast and in the Willamette Valley the silage was found to be low in dry matter (less than 17%) and relatively high in acidity (2.24%), and in general seems not to be favored by farmers where corn can be grown. In eastern Oregon the silage contained 21.8% dry matter, was low in acidity (1.42%), and was very similar in compn. to samples analyzed at the Montana Station (Arnett, Joseph and Tretsven, Montana Sta. *Bull.* 131, 13-29(1919)). In this less humid region of the State farmers report conspicuous success with sunflower silage, particularly for dairy herds.

H. G.

**Kaolung.** *Calif. Sta. Rept.* 1920, 71; *Expt. Sta. Record* 44, 768.—Kaolung, or grape seed oil meal, was found to have the following compn.: water 9, crude protein 12.78, fat 6.7, fiber 37.05, N-free ext. 31.95, ash 2.52, and tannin 1.25%. It is noted that nearly 40% of the material is crude fiber; this indicates in this case mainly the shell of the seed, which has practically no food value.

H. G.

**Food value of willow leaves.** T. D. HALL. *Union S. Africa, Dept. Agr.* J. 1, 456, 457(1920); *Expt. Sta. Record* 44, 866.—Proximate analyses of willow leaves (with some twigs) are reported. It is stated that these leaves are sought after by range cattle early in the spring. The moisture content averaged 67.6, crude protein 5.4, and crude fiber 7%. Analyses of the ash showed high proportions of Ca and Mg.

H. G.

**Analysis of Russian thistle hay.** *N. Dakota Sta. Bull.* 146, 5(1921); *Expt. Sta. Record* 45, 266.—Russian thistle hay was found to have the following compn.: moisture

6.5, crude protein 12.5, ether ext. 3.3, crude fiber 22.3, N-free ext. 39.9, ash 15.5%. A mineral analysis is also given. The cathartic properties of the hay are attributed to KCl.

H. G.

**Forage materials (in the Sudan).** A. F. JOSEPH. *Wellcome Trop. Research Lab., Chem. Sect. Publ.* 18, 17-21(1921); *Expt. Sta. Record* 45, 774.—Proximate analyses are reported including detns. of pentosans and sol. carbohydrates.

H. G.

**The selection of a simple and reliable method for determining the degree of hydrolysis of crude fiber.** VON WISSELL. *Landw. Vers. Sta.* 96, 263-75(1920); *Expt. Sta. Record* 45, 615.—Various methods are discussed for detg. the degree of hydrolysis and consequent digestibility of feeding stuffs prep'd. by digesting the straw of cereals and other materials rich in cellulose with dil. alkali. The procedure recommended is the detn. of the loss in wt. on hydrolysis with 1% NaOH, the application of the phloroglucinol test for lignin, and the detn. of the Cl absorbed from bleaching powder. A table is given of the results of such an analysis with a no. of feeding stuffs thus prep'd.

H. G.

**The detection of ricin in feeding stuffs by means of serological methods (precipitation, complement deviation, and conglutination) as well as hemagglutination.** W. PFELER AND F. ENGELHARDT. *Landw. Jahrb.* 53, No. 2, 561-83(1919); *Expt. Sta. Record* 45, 413.—Results are reported of a series of studies of the delicacy and specificity of various serological tests for the presence of castor bean meal in feeding stuffs. The antiricin serum was obtained by immunizing rabbits with increasing doses of ricin. Pptn. tests with this serum gave positive results with 0.001 g. of ricin and with feeding stuffs contg. 5% and in some cases only 1% of castor bean meal. Control tests with abrin and crotin gave negative results, indicating the specificity of the reaction for ricin. Hemagglutination tests were positive in the presence of 0.0005 g. of ricin, but were not sp. as the reaction was also given with bean meal. The complement deviation test gave positive results with ricin 1 : 200,000, 0.001 g. of castor beans, or feeding stuffs contg. 0.5% of castor bean. This test was strongly specific. The conglutination test gave positive results with ricin 1 : 200,000, 0.0002 g. of castor bean, and feeding stuffs contg. 0.5 to 5% of castor bean. This test however, proved nonsp., bean meal also giving positive results. Conclusion: For forensic purposes the pptn. and deviation tests are the most reliable, and the pptn. method has the advantage of being simpler of execution.

H. G.

The thermal death point of the spores of *Bacillus botulinus* in canned foods (WEISS) 11C. A rapid method of determining the presence and type of botulinus toxin in contaminated foods (ORR) 11C. The exploitation and utilization of grape marc (VENTRE) 16. Phosphoric acid production for food purposes (WAGGAMAN) 18. Moisture absorptive power of different sugars and carbohydrates under varying conditions of atmospheric humidity (BROWNE) 28. Technical utilization of asphodel root (BAMBERGER, *et al.*) 16.

ANDREA, A. L.: *Dehydrating Foods*. Boston: Cornhill Co. 206 pp.

ANON.: J. König's *Chemistry of Human Foods and Condiments*.—Supplement to Volume I: (a) *Composition of Animal Fats*. Edited by J. Grossfeld, A. Splittgerber and W. Sutthoff. 4th Ed. Berlin: Julius Springer. 584 pp.

McKILLOP, MARGARET: *Food Values: What They are, and how to Calculate Them*. London: Routledge & Sons. 171 pp. 3s. 6d. Reviewed in *Chem. Age* (London) 6, 793(1922).

Condensed milk, H. S. MELLORT. U. S. 1,428,810, July 25. Milk is subjected

for a short time to a "disrupting temp." (preferably above 82°) while permitting escape of vapors formed and is then quickly cooled.

**Bread making.** CAMPBELL, BAKING CO. Brit. 177,783, March 28, 1922. The keeping qualities of bread are increased by adding a non-toxic peroxide to the dough batch, which is thus able to absorb more moisture than ordinarily. The amt. of peroxide added is small to avoid breaking-down of the gluten. Suitable proportions of H, Ca, Mg, Na and K peroxides are stated. The peroxide is generally introduced in powder form at the dough stage of the sponge, but it may be previously mixed with any of the dough constituents.  $H_2O_2$  is introduced with the  $H_2O$ .

**Preserving meat.** WILSON & Co. Brit. 177,988, March 29, 1921. In curing or pickling meat by means of mixts. or solns. containing salt and saltpeter or other nitrates, a culture of a particular bacterium is added to the preservative mixt. The bacterium is found in ordinary pickling solns. and is characterized by being a non-putrefactive, non-pathogenic, nitrate-reducing micrococcus. It is cultivated in beef broth containing a small proportion of Na nitrate or other nitrate. The process is described as applied to the manuf. of sausages and to pickling hams.

**Food for animals.** J. A. O'LOUGHLIN. Brit. 178,201, Jan. 12, 1921. A food for animals is prepd. by mixing the sol. albuminoids and fats obtained by boiling down slaughter-house refuse and bones and evaporating the liquor, with molasses or other carbohydrates and cereal or other meal. The albuminoids and fats, in the form of a jelly or powder, are mixed with molasses, etc., at a temp. at or near the b. p., and the cereals, etc., either whole or ground, boiled or unboiled, are mixed therewith while hot. The product is desiccated and ground. Meals containing vitamins are employed such as maize, rape, bean, oat, or linseed meal, or crushed or ground brewers' grains.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Pittsburgh as an industrial center. J. H. JAMES AND W. F. RITTMAN. *J. Ind. Eng. Chem.* 14, 772-5(1922). E. J. C.

Commercial, industrial and economic index of chemicals and drugs. ANON. *Rev. prod. chim.* 24, 601-3, 629-36, 661-8, 699-706, 737-44, 771-8(1921); 25, 9-16, 45-52, 81-8, 117-24, 149-54, 191-5, 225-32, 263-8, 299-304, 335-40, 371-6, 407-12, 443-8(1922).—An index giving synonyms, foreign names, compn., properties, prepn., uses, markets, com. grades, usual methods of packing, (Fr.) customs tariffs and statistics, and railway rates. A. P.-C.

Study of chemical engineering by the 'unit-operation method. W. K. LEWIS AND R. T. HASLAM. *J. Ind. Eng. Chem.* 14, 647-50(1922).—A detailed explanation of the methods of instruction used in the School of Chemical Engineering Practice, Mass. Institute of Technology. W. L. BADGER

The electric drive in the chemical industry. WM. A. A. BURCHSS. *Beams* 10, 412-7(1922).—A survey. The subject is treated under the following headings: handling of liquors, handling of solids, grinding and mixing, choice of current, and selection of motors. C. G. F.

Heat transmission and evaporation. W. L. BADGER. *J. Ind. Eng. Chem.* 14, 806-9(1922).—A review and general discussion. E. J. C.

Carbonization of lubricating oils. C. E. WATERS. *U. S. Dept. Com. Bur. Standards Circ.* 99, 44 pp.(1920); *Expt. Sta. Record* 44, 887.—The nature and effects of the deposits formed in internal-combustion engines are discussed. It is shown that the term 'C' is incorrect because the deposits consist largely of asphaltic matter. Brief accounts

are given of the nature of petroleum oils and of the theories concerning the formation of deposits. The oxidation and cracking of petroleum are discussed in detail. Carbonization tests which depend upon oxidation and upon cracking are next taken up, full descriptions of app. and methods being given. The opinion is expressed that there are ample theoretical reasons for believing that both the oxidation and cracking tests give trustworthy indications of the character of lubricating oils, but it is concluded that there is much yet to be learned upon the whole subject of the lubrication of internal-combustion engines.

H. G.

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Electrical insulating papers (ANON.) 23. Progress on emulsions (PARSONS) 2.

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**Effecting chemical reactions.** THERMAL INDUSTRIAL & CHEMICAL RESEARCH CO. LTD. AND J. S. MORGAN. Brit. 176,864, Dec. 8, 1920. For effecting chem. reactions by a fusion process, the mixt. of substances which are to react are caused to travel upon or through a bath of molten metal or alloy heated to the required temp.; or in the special case in which the metal is itself one of the reacting materials, then the other material must necessarily travel through the bath. In the manuf. of phenol benzenesulfonic acid and NaOH are fed on to the surface of a bath of molten lead at a temp. of 390° and are depressed beneath the surface of the molten metal by a rotating iron drum as described in 174,974; the rate of revolution of the drum is such that the mixt. is submerged for 15-30 sec. and the PhONa formed is removed from the drum by a scraper. In the manuf. of NaNO<sub>2</sub> powdered NaNO<sub>3</sub> is fed on to a bath of molten Pb at a temp. of 450° and is carried through the bath as in the previous example; after 3-5 sec. contact, the NaNO<sub>3</sub> is reduced, and the mixt. of NaNO<sub>2</sub> and PbO is removed and sepd. by leaching. Cf. 16, 834(1907), and C. A. 16, 2378.

**Mixing solids with liquids at controlled temperatures.** O. D. CUNNINGHAM. U. S. 1,422,421, July 11. In adding solids to liquids, *e. g.*, reacting on solids with H<sub>2</sub>SO<sub>4</sub>, the desired temp. is maintained by circulating the liquid through a mixing chamber of small capacity and a cooling chamber of larger capacity, and the rate of addition of the solid is also maintained in accord with the temp. requirements.

**Purifying liquids.** SOC. RICARD, ALLENET, ET CIE. Brit. 177,761, Nov. 22, 1921. The process for clarifying saccharine juices by adding a sol. alginate and pptg. an insol. alginate is applied to liquids of different classes. As examples are described the treatment of tannin ext. with (HCO<sub>3</sub>)<sub>2</sub>Ba as the precipitant; of fermented beet juice with an alginate and H<sub>2</sub>SO<sub>4</sub>; and of the waste H<sub>2</sub>O from starch factories with an alginate and lime. The ppt. obtained is used as fertilizer in the first case and as food for animals in the second and third. When the liquid treated contains a substance which will ppt. the alginate, as in the case of brandy contaminated by contact with Fe, the addition of further precipitant may be unnecessary, but it may be added if the alginate is in excess. Cf. C. A. 16, 1517.

**Distilling.** G. A. BRONDER and T. COSTIGAN. Brit. 176,847, Nov. 15, 1920. The volatile constituents of shale and other materials are recovered by the continuous circulation through the materials of air and generated vapors heated in a heating chamber. A suitable construction is specified.

**Lubricants.** E. EICHWALD and P. HARDT. Brit. 178,113, April 4, 1922. Lubricants are manufd. by treating the products of crude tar distg. between 260° and about 320° by known processes to increase their viscosity, *e. g.*, by blowing air into them or treating them with alternating elec. currents. A product more free from suspended matter is obtained by first freeing the distillate from phenols, and deparaffining it, for

instance by cooling to  $-10^{\circ}$ , and pressing out the sepd. paraffin, or by shaking it with acetone or other solvent.

**Lubricating oil.** W. K. BOHLBAU. U. S. 1,423,512, July 25. Neutral wool fat 2-12% is added to lubricating oil for use in automobile engines of the Ford type, and for lubrication of the friction bands.

**Cooling composition for hot journal boxes.** J. Q. GILL. U. S. 1,423,103, July 18. A mixt. of soap (formed from corn oil and castor oil), and a small amt. of free alkali, ivory black, methyl salicylate and  $H_2O$  to the amt. of over half the mixt.

**Refrigerating agent.** A. J. A. OTTESEN. Brit. 178,104, Dec. 9, 1920. A soln. of one or more inorg. salts and one or more org. substances such, as glycerol or other alcs., or carbohydrates is used. The addition of 5-20% or more glycerol to a 15% NaCl soln. lowers the f. p. of the soln. by  $2-7^{\circ}$  further.

**Electric resistances.** GENERAL ELECTRIC CO. Brit. 170,905, Dec. 18, 1920. A resistance material comprizes a plastic non-conducting base, such as concrete, intimately mixed with from 17 to 25% by vol. of lampblack. The lampblack may be obtained from crude petroleum, and the concrete may comprize portland cement and white river sand intimately mixed together in the proportion of 1-2 parts by vol. In order to get a uniform product, the material may be heated for long periods in air or steam. The resistance of the material decreases with increasing voltage or power, as is essential in the construction of protective reactors of the type described in 109,129.

**Electrical insulating composition.** J. E. BARRINGER. U. S. 1,423,985, July 25. An insulating compn. which is resistant to heat is formed of shellac,  $NH_4OH$  and Na silicate with coloring and filling materials.

**Prevention of corrosion in turbines.** R. W. BAILEY AND METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 177,235, Dec. 20, 1920.  $H_2O$  or a non-volatile alkali or other neutralizing soln. is injected continuously into the steam during working. The  $H_2O$  is injected at the point in the path of the steam where moisture is first formed, and the soln. of non-volatile alkali, etc., at an earlier point. Cf. 124,101.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Analysis of lithia water.** D. BUTESCU. *Bull. soc. chim. Romania* 4, 26-34 (1922).—The water originated at the source of the Tamaseu, Bihor, Transylvania. G. E. S.

**Bacteriological examination of water.** W. C. DE GRAAF. *Tijdschr. vergelij. Geneeskunde* 7, 108-29 (1922).—In bacteriol. examn. of water quant. detn. of the number of bacteria in 1 cc. is uncertain. Cultivation at  $35^{\circ}$  for 3 days gives more const. results. For identifying bacteria of intestinal origin the method of fermentation at  $45^{\circ}$ , according to Eijkman, is used. This method is based on the fact that thermo-resistant bacteria exist in the intestine, capable of fermenting glucose. C. isolates *B. coli*, *B. butyricus* and *B. streptococci* and states that only *B. coli* will ferment glucose under the conditions prescribed by Eijkman. The thermoresistant bacteria are characterized by a positive methyl-red reaction and a negative Voges-Proskauer reaction.

R. BEUTNER

**River pollution from milk depots.** WM. G. SAVAGE AND D. R. WOOD. *J. State Med.* 30, 307-16 (1922).—Milk factory wastes are equiv. to approx. 150 times as much ordinary sewage and may create very serious nuisance by their discharge into rivers and other water courses. Whey is more objectionable than washings contg. milk, and is very difficult to treat. (1) Storage in tanks with subsequent discharge into a water course, (2) storage in tanks with chem. treatment, (3) land treatment, and (4) biol.

methods were found unsatisfactory. Washings from floors, churns, etc., may be treated by ordinary biol. processes. Utilization of food value of whey for animal and human consumption is advocated.

G. C. BAKER

**Standard bacterial index.** P. V. WELLS AND W. F. WELLS. *J. Am. Water Works Assoc.* 9, 502-27 (1922).—A statistical study of the advantages of the log of the number of bacteria per l. as a bacterial index.

D. K. FRENCH

**Some phases of the stream pollution problem.** J. K. HOSKINS. *J. Am. Water Works Assoc.* 9, 570-81 (1922).—The researches in connection with this problem conducted by the Public Health Service cover the nature and treatment of industrial wastes and stream pollution and stream purification. The objects include the detn. of the nature and effects of primary types of polluting substances and both the fundamental laws and active agencies that operate in stream purification. Most of the work is being done on the Ohio and Illinois rivers. A final report is not yet ready though considerable data have been collected. Cf. C. A. 15, 2320.

D. K. FRENCH

**Chlorination prior to filtration.** N. J. HOWARD. *J. Am. Water Works Assoc.* 9, 606-11 (1922); *Eng. News-Record* 88, 880.—Chlorination at the Toronto filter plant is applied prior to slow sand and drifting sand filtration as an economical and effective substitute for alum. The saving in the cost of chemicals for one year was nearly \$35,000.00 or nearly 60%. The problem of taste was negligible as with a Cl dose of 0.15 and 0.3 p.p.m. excess Cl was entirely absorbed in the drifting sand filters. Rate of filtration was increased and purer water obtained.

D. K. FRENCH

**Experiences with algae at Davenport.** C. R. HENDERSON. *J. Am. Water Works Assoc.* 9, 622-3 (1922).—In one case "melosira" developed,  $\text{CuSO}_4$  gave no improvement; liquid Cl 2.16 p.p.m. ultimately destroyed the organism. At another time a growth of *Oscillaria* caused trouble.  $\text{CuSO}_4$  here was effective, while Cl as  $\text{CaOCl}_2$  was ineffective.

D. K. FRENCH

**Control of steam boiler operation.** GERMER. *Industrie u. Technik* 22, 3 (1922); *Gas u. Wasserfach* 65, 220-1 (1922).—G. advises against the use of worm wheel, and velocity type meters for the measurement of warm water, because of the error introduced by scale formation on the delicate parts. "Volume" meters are recommended,\* and for larger installations the Venturi meter is preferable.

MARTIN E. FLENTJE

**Scale-formation and corrosion in boilers.** ALAN A. POLLITT. *Chem. Age* (London) 7, 76-8 (1922).—The effect of impurities (mineral) commonly occurring in boiler feed water and the mechanism of the corrosive reactions largely responsible for the deterioration of plates and tubes are discussed.

G. C. BAKER

**Mechanical sewage purification by means of "Schlamm-schleusen" basins, and clear well, for municipal plants.** KROFF. *Die Stadtereinigung* No. 2, 10-12 (1922); *Gesundh. Ing.* 45, 321 (1922).—K. reports on the operation of a test sewage purification plant at Stuttgart, consisting of a sludge basin, clear well, and digestion basin. The dimensions of the sludge basin are 17 m. by 2 m., with a water depth of 2.35 m. The clear well has an area of 3.43 m.<sup>2</sup> and a capacity of 58.3 m.<sup>3</sup>. The digestion chamber has a capacity of 150 m.<sup>3</sup> divided into 6 compartments by baffle walls. The following observations were made: (1) the amt. of dissolved and colloidal material has no effect on the operation; (2) there is no evidence of decompn. in the basins; (3) 89 to 93% of the suspended matter is removed in the basin; (4) 3-4 min. is required for the suspended matter to settle and (5) 5.5 m.<sup>3</sup> of sludge pptd. out from 294.7 m.<sup>3</sup> of sewage, with a moisture content of 97-98%.

MARTIN E. FLENTJE

**Surface purification of sewage.** W. D. SCOULLER. *Surveyor* 58, 447-8 (1920); *Expt. Sta. Record* 45, 187.—The org. matter is gradually deposited and forms a tenacious slime when sewage is passed over a surface in the presence of air. The org. matter first deposited gives  $\text{H}_2\text{S}$  when fermented anaerobically. The slime has the property of

withdrawing colloidal matter from sewage and acts as a reducing agent. Disintegration of the slime began 10 weeks after starting the expt. and coincided with the appearance of small worms. At the same time nitrification set in, denoting that oxidation is related to slime disintegration. Nitrification was never noted after the sewage travelled 10 ft. and the free and saline  $\text{NH}_3$  which disappears from the settled sewage was not all recovered as oxidized N in the effluent. Rate of purification varies with the surface used. When water contg.  $\text{H}_2\text{S}$  was passed over surfaces previously used for treating sewage the  $\text{H}_2\text{S}$  was mostly absorbed by the slime, and partly converted to sulfate. The slime absorbed sulfate from the sewage but records were insufficient to show what actually happens.

G. C. BAKER

The Dresden sewage purification plant. SCHEITZOW. *Gesundh. Ing.* 45, 302-10 (1922).—From 80,000 to 1.5 mil.  $\text{m}^3$  of sewage are treated daily. Rough screening is carried out by means of 2 tiers of 3 rakes, each 4.3 m. wide and 1.2, 1, and 1.4 m. high. In low water but one tier is used. A 70 by 5.6 m. canal leads the sewage to a building, 59 by 10.6 m., housing the 4 fine screens, each of which has a diam. of 8 m., and rests at an angle of  $22.5^\circ$ . The openings on these screens are 2 mm. in width and 30 mm. long. The material remaining on these screens, approx. 34.5% of the total suspended matter, is removed by brushes, revolving on a piston mounted at the same angle as the screens. The screened material is brushed into elevator bins, elevated mechanically and dumped into wagons holding 4  $\text{m}^3$ . Disinfection of the sewage is carried out by the use of hypochlorite in 2 installations before the plant is reached, and by  $\text{Cl}$  gas, in the plant itself. At the last disinfecting station  $\text{FeSO}_4$  soln. is also added to prevent the killing of fish in the Elbe river into which the effluent flows. The flow through the plant is by gravity, except during exceptionally high water, when electrically driven pumps are used. The wet sludge when used for fertilizer purposes proved to be a nuisance because of further decompn. The excessive moisture content has made centrifugal drying impossible, and drying by steam has been resorted to. Plans for a grease removal plant were interrupted by the War, which also increased the demand for fertilizers, so that the sludge is now sold for 4 M per  $\text{m}^3$ . Algal growths, *Spharotilus natans*, caused by wastes from cellulose plants, grow more abundantly in the purification plant effluent. Cost tables and engineering drawings of the installation are given.

M. E. F.

Some conclusions drawn from a recent survey of sewage treatment plants. H. H. WAGENHAUS. *J. Western Soc. Eng.* 27, 239-52 (1922); cf. C. A. 16, 2945.—Discussions are included.

G. C. BAKER

Disposal and purification of flax-retting effluents. A. J. H. GAUGH. *J. Soc. Chem. Ind.* 41, 177-8T (1922).—Waste liquors from retting flax are dark yellowish green liquids with offensive odors and acid reaction. They differ from raw sewage in having less suspended matter and less N. Effluents from different factories and from the same factory at different times vary widely in the amt. of the several constituents. Raw ret waters cannot with safety be discharged into rivers unless the latter are of tidal character insuring enormous diln. Ret waters may be partially purified by pptn. with  $\text{CaO}$  and  $\text{Al}(\text{SO}_4)_3$ . Biologic treatment on sand or percolating filters of clinker, coke, etc., will purify the waters to an extent which will permit of their safe discharge into streams. After neutralization there appears no reason why the ret waters may not be discharged into the local sewerage system, or under proper conditions applied to the land.

L. W. RIGGS

The removal of London garbage. WERNERKE. *Gesundh. Ing.* 45, 328-9 (1922).—A résumé.

MARTIN E. FLINTJIE

Chemistry in sanitation. A. M. BUSWELL. *J. Ind. Eng. Chem.* 14, 840-2 (1922).—A review.

E. J. C.

The kato-thermometer as a measure of ventilation. LEONARD HILL, H. M. VERN



NON AND D. HARGOOD-ASH. *Proc. Roy. Soc. (London)* **93B**, 198-206(1922).—A study of the use of the dry katab thermometer to measure wind velocity and temp. and of the wet katab thermometer to measure wind velocity, temp., and evapn. J. S. H.

Adsorption of proteins, enzymes, toxins and sera by aluminium hydroxide (RAKUSIN) 11G.

GREIMER, KARL: *Handbuch des praktischen Desinfektors*. 2nd Enlarged and revised ed. Dresden and Leipzig: Theodor Steinkopff. 197 pp. M 45; cardboard, M 50. Reviewed in *Gesundh. Ing.* **45**, 311(1922).

SCHWITZ, GEORG: *Hilfstafeln zur Bearbeitung von Meliorationsentwürfen und anderen Wasserbautechnischen Aufgaben*. 2nd Revised ed. Berlin: Paul Parey. M 100. Reviewed in *Gesundh. Ing.* **45**, 311(1922).

Softening water. C. B. HAINES. U. S. 1,423,657, July 25. A H<sub>2</sub>O-softening chemical such as lime and alum in stick form is used for treating H<sub>2</sub>O as it flows through a pipe.

Apparatus for softening water by treatment with zeolitic material. H. J. MARGRATH. U. S. 1,423,132, July 18.

Settling and septic tank for sewage. E. F. COOK. U. S. 1,422,674, July 11.

Fermentation chamber for treating garbage and similar materials. G. BECCARI. U. S. reissue 15,417, July 25. See original pat. 1,329,105, C. A. 14, 998.

Treating sewage, etc. E. VON SPRINGBORN. Brit. 176,816, Sept. 3, 1920. A medium for the filtration of sewage or waste liquors is obtained by cutting peat moss into blocks, soaking in an aq. soln. of alum and drying in an oven from which air is excluded. A suitable construction is specified.

Sterilizing air. A. WOLFF. U. S. 1,423,704, July 25. Water is washed on the countercurrent principle in finely divided form with an aq. soln. charged with ozone, the soln. being replenished with ozone after each use.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The importance of new soil investigations for agriculture. J. KÖNIG AND J. HASENBÄUMER. *Landw. Jahrb.* **55**, 185-252(1920); *Expt. Sta. Record* **46**, 419-20; cf. C. A. **14**, 584.—A no. of the more recently developed soil-investigation processes are reviewed quite comprehensively, and those features of the results obtained which have an important bearing on soil fertility and agricultural development are studied and discussed. Conclusion: These studies and processes have established new conceptions upon which to base the judgment of soil. Important among these are H-ion concn. as an indication of the degree of soil acidity or alk., titration acidity as an indication of lime requirements, the relation of the size of grains of individual soil, and the content of colloids, gels, and exchangeable salts. H. G.

Soil investigations. F. J. SIEVERS. Washington Agr. Expt. Sta., *Bull.* **158**, 33-4(1920); *Expt. Sta. Record* **45**, 216.—Fertilizer expts. conducted in several counties indicate conclusively that most acid soils are deficient in P and that application of lime alone gives poor results unless supplemented with P fertilizer. Much of the difficulty experienced in growing clover is due more to deficiency of P than to acidity.

M. S. ANDERSON

Soil studies. J. B. LINDSEY. Mass. Agr. Expt. Sta., *Ann. Rept.* **1920**, 25a.—

Soil plots treated with  $(\text{NH}_4)_2\text{SO}_4$  which showed a toxic effect on plant growth contained at least 175 p. p. m. of  $\text{MnSO}_4$  to dry soil. Sol. Al was present in much less quantity and only a trace of Fe. The injury in such plots was greatest in seasons of early drought. Toxicity was to a considerable extent corrected by lime which greatly lowered the quantity of Mn and Al in sol. form.

M. S. ANDERSON

**Soil survey of Iowa. Reports 13-18.** W. H. STEVENSON, P. E. BROWN, *et al.*, *Iowa Sta., Soil Survey Repts.* 13, 46 pp.; 14, 60 pp.; 15, 60 pp.; 16, 54 pp.; 17, 60 pp. (1920); 18, 56 pp. (1921); *Expt. Sta. Record* 45, 512.—These reports present analyses and greenhouse and field expts. to det. the compn., fertilizer requirements, and crop adaptations of the different soil types of the respective counties. The soils are grouped as drift, loess, terrace, swamp, and residual.

H. G.

**The alluvial soils of Fiji.** C. H. WRIGHT. *Fiji Dept. Agr. Bull.* 11, 12 pp. (1919); *Expt. Sta. Record* 46, 316.—Mech. and chem. analyses of a no. of samples of typical soils are reported and discussed.

H. G.

**Chemical analysis of soils: its value and limitations.** J. CRABTREE. *J. Board Agr. Brit. Guiana* 14, 218-25 (1921); *Expt. Sta. Record* 46, 620.—Considerable data from different sources on the chem. analysis of soils are summarized and the conclusion is drawn that chem. analysis alone can, in the present state of knowledge, indicate whether a soil is or is not fertile. It can usually elucidate cases of pronounced infertility in apparently fertile lands, but its greatest value directly to the everyday operations of the practical man is usually in conjunction with field trials.

H. G.

**Analyses of soils of Wilkes County.** W. A. WORSHAM, JR., D. D. LONG, L. M. CARTER, M. W. LOWRY AND W. O. COLLINS. *Ga. Col. Agr. Bull.* 225, 39 pp. (1920); *Expt. Sta. Record* 46, 17.

H. G.

**Methods of mechanical soil analysis.** D. J. HISSINK. *Internat. Mitt. für Bodenk.* 11, 1-11 (1921).—A critical study of methods of prepn. samples of soil for mechanical analysis indicates that methods of prepn. have a marked influence on results. Grinding, shaking or boiling has a pulverizing effect on soil grains and should not be used for sandy soils. The use of 0.2 N cold HCl followed by 0.1 N  $\text{NH}_4\text{OH}$  is preferable, although this dissolves some of the free humus acids and to some extent clay particles and humus colloids. Fresh and air-dry soils give practically the same results.

M. S. ANDERSON

**Chemical investigation of some clay soils of Surinam.** J. E. VAN AMSTEL. *Dept. Landb. Suriname Bul.* 41, [1] + 33 pp. (1921); *Expt. Sta. Record* 45, 328.—Studies are reported and discussed of the compn. and properties of representative clay soils of Surinam in Dutch Guiana, together with results of chem. analyses.

H. G.

**Composition of the sugar-cane soils of the French Antilles.** M. RIGOTARD. *Agron. Colon.* 6, 44-52 (1921); *Expt. Sta. Record* 45, 211.

H. G.

**The organic phosphorus content of some Iowa soils.** J. T. AUTEN. *Soil Sci.* 13, 119-24 (1922).—The N, P, org. C, and org. P for the surface, subsurface, and subsoil of 4 Iowa soils are reported. The analyses show that the soil having the highest latent fertility and the soil having the lowest latent fertility have the highest ratios of org. P to total P. The ratio of the org. P to total P is fairly const. at all depths save in 1 soil. There is a wider ratio in the org. P-N ratio in the surface soils than in the subsoil. The ratios of org. P to org. C are so different that no one ratio could be used to calc. the org. P from the org. C. The org. P is rather uniform in subsurface and subsoil.

W. J. ROBBINS

**Origin of soil colloids.** N. E. GORDON. *Science* 55, 676-7 (1922).—The theory is advanced that the origin of soil colloids is based largely upon chem. reactions. Many soil particles are hydrated silicates contg. Al, Fe, Si, Na, K, Ca, Mg, etc., and are surrounded by a closely held  $\text{H}_2\text{O}$  film. The salts in the outer layer of the particle are sub-

jected to const. hydrolysis. The hydrolytic products of Na, K, etc., are partly absorbed by the insol. hydrolytic products of the Fe and Al salts, forming an insol. gel casing for the soil particles. Equil. of the sol. salt between the  $H_2O$  film and the gel is established. When the soil becomes flooded this equil. is destroyed and soln. of the sol. absorbed salt continues until most of it is leached from the outer layer of the soil particles. With further leaching the gel products of Al, Si and ferric oxide may pass into colloidal soln. The encasing gel is thus removed and weathering of the silicate particles proceeds. Since the reaction is reversible, the peptized gel, or hydrosol, may be again deposited as a gel as the H-ion concn. varies in the soil through which it moves. K. D. J.

**The classification of soil moisture.** F. W. PARKER. *Soil Sci.* 13, 43-54(1922).—Alc. and glycerol solns. added to a dry soil are not rendered more concd. as would be the case if water was rendered unfree by the soil. It was also found possible to displace part of the soil soln. from a soil whose moisture content is less than that of the unfree  $H_2O$ . The much greater increase in the f. p. depression of soils with a decrease in the moisture content than is indicated by the law of inverse proportion is due to the solid material and not due to the existence of unfree  $H_2O$ . W. J. ROBBINS

**The evaporation of water from soil. II. Influence of soil type and fertilizer treatment.** B. A. KREN. *J. Agr. Sci.* 11, 433-40(1921).—Two soils, one of 6% clay, and the other of 15% clay content, taken from 3 plots (a, unfertilized, b, artificial fertilizer, and c, farmyard manure) were studied to det. effect of clay content and fertilizing treatment upon evapn. The rate of evapn. (over  $H_2SO_4$ ) was found dependent, (1), on the amt. of clay; and, (2), upon the amt. of org. matter in the soil. Differences due to org. matter were more obvious in the soil contg. the larger amt. of clay; the farmyard manure lost  $H_2O$  at the slowest rate, with the untreated plot intermediate between the two. In the sand soil the differences due to fertilizing were small. R. B. D.

**The relation between the clay content and certain physical properties of a soil.** B. A. KREN AND H. RACZKOWSKI. *J. Agr. Sci.* 11, 441-9(1921).—A simple expl. method for measuring (1) apparent sp. gr., (2)  $H_2O$  taken up per unit wt. of soil, (3) pore space, (4) sp. gr., and (5) vol. expansion of unit vol. of soil when satd. Six depths of one soil (0-6", 6-12", 12-18", 18-24", 2-3' and 3-4') are offered as an example in which it appears that the values (1) and (4) varied inversely with the percentage of clay, while (2), (3) and (5) varied directly with the clay percentage of the soil. R. B. D.

**The flocculation of soils. II.** N. M. COMBER. *J. Agr. Sci.* 11, 450-71(1922); cf. C. A. 15, 2324; 16, 2750.—Types of mechanism whereby clay is flocculated by electrolytes are discussed: (1) normal or direct flocculation, (2) indirect flocculation and (3) abnormal flocculation. Expts. were performed to show that Fe and Al salts behave in a "normal" way.  $Ca(OH)_2$ , however, falls under the head of "abnormal." Because of its agricultural importance the action of  $Ca(OH)_2$  on clay is elaborately considered in this connection. The action of this compd. is not due to the formation of  $CaCO_3$ , but is an action on an "emulsoid gel surface." The OH ion may perform at least 2 functions in its coöperation with the Ca ion in the flocculation of clay, depending upon whether it is added with, after, or before the Ca ion. The effect of  $Ca(OH)_2$  upon "clay" and "silt" is detd. by the ratio of the emulsoid surface to the core of the particle. Thus in clay the surface dominates the system while in silt the core dominates. In very low concns. the OH ion appears to behave normally and to militate against the flocculation of clay by Ca salts. In ordinary soils, org. emulsoids may be partly responsible for the anomalous action of  $Ca(OH)_2$  on clay, but  $Ca(OH)_2$  exhibits a similar action on a deep subsoil clay contg. no org. matter. R. B. DEEMER

**On the use of the conventional carbon factor in estimating soil organic matter.** J. W. READ AND H. H. RIDGELL. *Soil Sci.* 13, 1-6(1922).—The % of C in samples of 37 surface soils varied from 30.20 to 56.27, the general av. being 49.26. This is 9 points

below the accepted value. The % of N would apparently indicate that a conventional factor for N would give more reliable information regarding the org. content of the soil.

W. J. ROBBINS

**Studies of sulfur oxidation in sulfur-floats-soil mixtures.** JACOB S. JOFFE. *Soil Sci.* 13, 107-18(1922).—At the end of 100 days approx. 6% more citrate-sol. P was found in bottles contg. a mixt. of floats, flowers of S and dry soil which were aerated than in those which were not. When varying quantities of  $H_2SO_4$  were added to the above mixt. in tumblers it was found that small quantities of  $H_2SO_4$  accelerated the development of sol. P and larger quantities decreased it. In liquid culture contg. S and  $Ca_3(PO_4)_2$  and mineral salts the development of sol. P takes place most rapidly when the  $p_H$  of the medium reaches 2.8.

W. J. ROBBINS

**Solubility of leucite in arable soil.** G. DE ANGELIS D'OSSAT. *Atti accad. Lincei* 30, i, 379-83(1921).—Vitreous fragments of leucite weighing 96.853 g. and having a total surface of 31.485 sq. dm. were kept in distd. water for 6 months, the water being changed each month and the total vol. used being 1.5 l.; the mineral lost 0.124% of its wt., but underwent no visible alteration. The non-sol. dissociated part assumed the form of a gel, the water clearing immediately after mixing. Another quantity of 69.345 g. of leucite with a surface of 4.3859 sq. dm., when treated for six months with 800 cc. of 2% citric acid soln., lost 0.677% of its wt., corresponding with 0.145 g.  $K_2O$ ; in this case also no superficial alteration was evident.

J. S. C. I.

**The cyanuric acid in soil.** SHIN-ICHIRO KASUGAI AND SHIRO OZAKI. *J. Sci. Agr. Soc. (Japan)* No. 232, 1-18(1922).—According to the method of the Dept. Agr. of U. S. K. and O. have attempted to isolate cyanuric acid from the soil of Ô-Yama, an extinct volcano, in Hôki Province without success. Physiol. action of the acid on *Pisum*, barley, and a kind of garden radish was studied. In water cultivation 0.02% acid acts as poison and 0.06-0.08% acid kills the plants. In sand cultivation the poisonous effect is developed in the concn. of 0.001% and the plant is destroyed by 0.05% acid. In soil cultivation, 0.02% acid is poisonous and 0.1% acid destroys the plant. The poisonous action of the acid is neutralized by  $Ca(OH)_2$  or  $CaCO_3$ .

K. K.

**The estimation of the available phosphoric acid in soils by Deniges' colorimetric method.** I. REIZO YAMAMOTO. *J. Sci. Agr. Soc. (Japan)* No. 233, 79-90(1922).—The color developed by the method of Deniges (*C. A.* 15, 218) is proportional to the quantity of  $H_3PO_4$  in concns. of 0.001-0.003 mg. P in 5 cc. soln.; above this limit the intensity of the color does not increase according to the increase of P. When the sample soln. does not exceed about 50 cc., the quantity of the 1st and 2nd reagent to be added is 3-4 and 1-2 drops, resp. As the reducing power of the 2nd reagent is decreased by about 30% after 48 hrs., it should be prepd. every day. The presence of alc.,  $Me_2CO$ , grape sugar, milk sugar,  $HCHO$ ,  $AcOH$ , sulfates or chlorides does not interfere;  $HNO_3$ ,  $HNO_2$ , and their salts, oxalic, tartaric, citric, and succinic acids and their salts do interfere with the color reaction. Small amts. of bases accelerate the development of the color. Fe salts and  $AlCl_3$  have a bad effect, which is, however, neutralized by adding excess of the 2nd reagent. Dried soils from many localities were extd. with  $H_2O$ , 1%  $AcOH$ , 0.1%  $HCl$ , and 0.2 N  $HCl$ ; the available  $P_2O_5$  in each soln. is given in tables.

K. K.

**Disappearance of soil nitrogen.** W. B. ELLERT. *Va. Agr. Expt. Sta., Ann. Rept.* 1919, 26-28.—Applications of 1200 lbs. per acre of lime on Hagerstown loam soil did not show depletion of the native soil N. Lime made conditions more favorable for corn and larger yields were produced with a heavier draft on the plant food elements.

M. S. ANDERSON

**The nature of certain aluminium salts in the soil and their influence on ammonification and nitrification.** IRVING A. DENISON. *Soil Sci.* 13, 81-106(1922).—No trace of sol. Al salts could be found in the water exts. of acid soils, though  $Al(NO_3)_3$

was found in the  $\text{KNO}_3$  ext. of the same soils after complete extn. of the acidity had been accomplished. Al salts, though perhaps occurring in some acid soils, do not contribute to their total acidity, but are themselves produced by the action of soil acids. Al salts are stimulating to ammonifying bacteria but act adversely upon nitrate bacteria in the soil. The effect is temporary.  $\text{CaCO}_3$  is the most effective material in reducing the toxic action of Al salts on nitrification.

W. J. ROBBINS

**Azotobacter in soils.** P. L. GAINES. *Science* 56, 21 (1922).—Examn. of 418 samples of soil indicated that the max. H-ion concn. tolerated by *Azotobacter* is very near  $10^{-4}$ . Introduced into a soil of greater H-ion concn., not contg. *Azotobacter*, they can exist an appreciable length of time.

K. D. JACOB

**A study of the fertility of the soils of Greece.** GEORGE BOUYOUKOS. *Soil Sci.* 13, 63-79 (1922).

W. J. ROBBINS

**Some experiments on reclamation of infertile alkali soils by means of gypsum and other treatments.** P. L. HEBBARD. *Soil Sci.* 13, 125-34 (1922).—Expts. were carried out in pots with alkali Calif. soils. Excessive salinity could be removed by simple leaching. Excessive alk. due to  $\text{Na}_2\text{SiO}_3$ ,  $\text{Na}_2\text{CO}_3$ , or  $\text{NaHCO}_3$  could be ameliorated with  $\text{CaSO}_4$  but to restore fertility the application of the  $\text{CaSO}_4$  should be followed by leaching. Increase of  $\text{CO}_2$ , as by decay of org. matter, may reduce alk. sufficiently to permit plant growth. When a soil contains 0.5% of Na salts or more, including some  $\text{Na}_2\text{CO}_3$ , it is improbable that it can be made fertile by the addn. of  $\text{CaSO}_4$  because the reaction between  $\text{Na}_2\text{CO}_3$  and  $\text{CaSO}_4$  tends to reverse. To prevent the reversal Na salts must be removed by leaching. It is not feasible to leach very alk. soils without adding some flocculating agent such as  $\text{CaSO}_4$  to prevent puddling. Water contg.  $\text{Na}_2\text{CO}_3$ , or  $\text{NaHCO}_3$  is not well adapted to leaching alkali soils. When  $\text{NaCl}$  or  $\text{Na}_2\text{SO}_4$  is removed from a soil by leaching the soil is likely to show a low H-ion concn. before all the  $\text{Na}_2\text{CO}_3$  is removed. This alk. may be toxic to plants.

W. J. R.

**Ferrous sulfate treatment of soil as influencing the soil solution obtained by the Lipman pressure method.** C. B. LIPMAN. *Soil Sci.* 13, 55-6 (1922).—The addn. of  $\text{FeSO}_4$  to soil in a lemon orchard at the rate of 5-10 lbs. per tree was found to increase the Ca, K, P, non-volatile solids, and total solids in the soln. obtained from the soil by the Lipman pressure method.

W. J. ROBBINS

**The relation of hydrogen-ion concentration in soils to their "lime requirement."** HARLAN W. JOHNSON. *Soil Sci.* 13, 7-22 (1922).—With 50 samples of widely varying types of soil no relation on the whole was found between the lime requirements as detd. by the Veitch method, and the H-ion concn. The Truog method of measuring the lime requirement gave results which were a combination of the Veitch lime requirement and the H-ion concn. In soils of similar types there is a relation between the apparent quantity of acids and the strength of the acids. Soil acidity in mineral soils is apparently due to weathering and leaching. Clay particles and org. matter act as "buffers."

W. J. ROBBINS

**Importance of liming humus soils.** S. ODÉN. *Intern. Mitt. Bodenk.* 9, 375-90 (1920); *Expt. Sta. Record* 46, 621; cf. *C. A.* 15, 2948.—The so-called acid character of unlimed humus soils is due not so much to the humus acids themselves as to adsorbed simple org. acids which hinder bacterial activity and the purely chem. processes. So-called Ca humate, originating from the reaction of humus acids with lime in limed humus soils, is considered to be of greater importance in such soils than pure lime, since it is thought to be a salt of the more insol. acids and is washed out of the soil with greater difficulty than lime. The adsorbed injurious org. acids are neutralized by Ca humate, setting free the non-injurious humic acids which permit the development of soil organisms. Studies of the fixation of water by limed and unlimed humus soils showed that limed soils always fixed more water than the unlimed soils, although the difference was

often very small. It was also found that the water was a little more firmly fixed in limed soils and was not so available to plants. Soils rich in humus fixed more water and were more retentive thereof than soils rich in ash. H. G.

**The removal of lime from soil by smoke gases containing sulfur dioxide.** P. RUANOV. *Centr. Gesam. Forstw.* 45, 283-90(1919); *Expt. Sta. Record* 45, 425-6.—R. reviews the work of others bearing on the subject, and briefly reports studies which showed that the degree of injury to vegetation by smoke gases stood in no proportional relation to the lime content of the soil or the removal of lime therefrom. Vegetation was injured almost as badly on soil contg. from 0.7 to 1.4% CaO as on soil contg. no lime. On the other hand, the injury by smoke gases was closely related to the content of  $H_2SO_4$  in leaves and needles. It is concluded that this is the main source of injury. H. G.

**Effect of lime and organic matter on impervious Kirkland upland soil.** M. A. BESSON. *Oklahoma Agr. Expt. Sta., Ann. Rept.* 1920, 17.—Studies of the  $H_2O$  content and of ammonification and nitrification at intervals during the growing season showed that limestone and to a greater extent limestone and fertilizer stimulated the action of ammonifying and nitrifying organisms. On treated plots the roots of alfalfa penetrated deeper into the hard pan than in those untreated. Practically all the C present was found to be in org. form. M. S. ANDERSON

**The influence of lime and magnesia on the growth of plants.** T. PFEIFFER, A. RIPPKE, AND C. PFOTENHAUER. *J. Landw.* 68, No. 1, 5-39(1920); *Expt. Sta. Record* 45, 425.—Studies are reported the results of which are taken to indicate that there should be a fixed relation between all plant nutrients in soil for economic reasons. It was found, however, that the Loew theory, that a variation from a fixed ratio between lime and magnesia injures crop growth, is not always correct. Approx. the same crop yields were obtained in 4 different series of expts. in which the lime-magnesia ratio varied between 9 : 1 and 1 : 1. There was practically no variation in the amts. of lime and magnesia assimilated by the plants as indicated by analyses. Oats endured a high excess of lime. Crop yields were decreased when the lime-magnesia ratio was varied from 1 : 1 to 1 : 9, which is attributed not to injury by the magnesia but to a deficiency of lime. However, there are indications that there may be a partial substitution of magnesia for lime although the lime is of the greater importance in plant growth. The content of exptl. oats plants in lime and magnesia varied within wide limits and in some cases was very high. The general rule that magnesia predominates in the grain and lime in the straw was seldom confirmed. An increasing assimilation of magnesia was not accompanied by a corresponding increase in assimilation of phosphoric acid. The content of the oats plants in potash and soda was rather high and did not decrease when the assimilation of lime and magnesia increased. H. G.

**Some experiments bearing on the results of exposure of superphosphate to ordinary weather conditions.** A. J. PERKINS. *J. Dept. Agr. S. Aust.* 24, No. 8, 664, 665, 667-9(1921); *Expt. Sta. Record* 46, 219.—Expts. are reported to det. the influence of weather conditions on the chem. compn. of superphosphate exposed in bags. Conclusion: When bags of superphosphate are accidentally exposed to the weather the loss of sol. material is not so great as is usually supposed, and aside from caking and subsequent sowing difficulties, the superphosphate will not suffer very materially from occasional showers. The difference between the compn. of the fertilizer and the guaranteed analysis is not necessarily due to careless storage. H. G.

**Antagonism.** O. NOLTE. *Landw. Jahrb.* 55, No. 2, 287-91(1920); *Expt. Sta. Record* 46, 425.—A brief review is given of studies relating to the theory of the lime factor and of the lime-potash law. It was found that the assimilation of potash by certain grain crops at first decreases and then increases when a part of the potash is displaced by Na. Where magnesia was substituted for lime the content of lime in grain

crops decreased, while those of magnesia and  $P_2O_5$  increased. The potash content first increased and then decreased, and the Na content steadily decreased. The greatest plant yield was obtained when the ratio of the lime to the magnesia contents was 1 : 1. Where lime was substituted for potash the lime content of grain crops increased, and the potash, Na, and  $P_2O_5$  contents decreased. H. G.

**Carbon dioxide in soil air.** J. SEN. *Agr. Research Inst. Pusa, Sci. Repts.* 1919-20, 41-3; *Expt. Sta. Record* 45, 323.—Periodical detns. of the  $CO_2$  content of the soil air of a grassed plat, a grassed plat partly aerated by trenches, and a surface-cultivated plat showed that the % of  $CO_2$  in the soil air was highest in the grassed plat and lowest in the cultivated plat. The variations in the  $CO_2$  content were greatest in the grassed plat and smallest in the cultivated plat. H. G.

**An improvement of the stirring electrode.** C. W. G. HETTERSCHIJ. *Chem. Weekblad* 19, 294(1922).—H. suggests an improvement of the H electrode used for detg. the  $p_H$  of soil. The electrode is protected by means of a glass tube against the scouring action of the soil while the mass is stirred. R. BEUTNER

**The movement of saturated water vapor through quartz flour.** SCOTT EWING. *Soil Sci.* 13, 57-61(1922).—An equation  $dq/dt = Ah^2 + B \log h - A$ , where  $q$  = the quantity of water,  $t$  = the time and  $h$  = the height, is developed to express the movement of satd. water vapor through soil. Tested exptly. with quartz flour an agreement is found. W. J. ROBBINS

**The fertilizer industry.** WM. H. WAGGAMAN. *J. Ind. Eng. Chem.* 14, 789-91 (1922).—A general discussion. E. J. C.

**The fertilizer business as a chemical industry.** F. S. LODGE. *Am. Fertilizer* 56, No. 12, 28-32(1922).—A discourse. W. H. ROSS

**The fertilizer situation.** U. S. Senate, 66 Cong., 3 Sess., Doc. 410, 27 pp.(1921); *Expt. Sta. Record* 45, 729-30.—Data are given on the amt. of com. potash, N, and  $P_2O_5$  available for fertilizer purposes and the price of each of these articles as compared with the prices for 1913. H. G.

**Soil reaction and choice of fertilizers.** R. GANS. *Internatl. Mitt. Bodenk.* 10, No. 5-6, 186-96(1920); *Expt. Sta. Record* 45, 330.—G. discusses the chem. features of fertilizer selection on the basis of soil reaction. It is pointed out that the acidity of inorg. soil constituents is produced mainly by mixts. of hydrates of silica and alumina derived from soil weathering. The degree of acidity depends upon the intimacy of the mixt. of these hydrates, the so-called mol. mixts. being the most strongly acid, followed in order by the so-called non-molecular mixts. and the coarse mixts. H. G.

**New investigations on the agricultural value of forest litter.** L. TSCHERMAK. *Centbl. Gesam. Forstw.* 45, No. 9-10, 193-219(1919); *Expt. Sta. Record* 45, 330.—Studies are reported on the absorptive power and fertilizing value of forest litter. The absorptive power of the litter increased rapidly with its degree of decompn., and when strongly decomposed was found to be due not only to its humus content but also to the coarser constituents, such as needles. The fertilizing value of forest litter was found to depend upon its content of both N and valuable mineral substance. The N content of decomposed forest litter is considerably greater than that of newly fallen needles and leaves, varying in the latter case from 0.5 to 0.8%, while that of the humus in humid localities averaged from 2 to 5%. The fertilizing value of forest litter compared favorably with that of winter rye straw when strongly decomposed, but was only about half so valuable when in fresh condition. Beech leaves were apparently more valuable than conifer needles. H. G.

**Synthetic nitrogenous fertilizers.** E. J. RUSSELL. *J. Min. Agr.* 27, 1037-45(1921); *Expt. Sta. Record* 45, 518.—R. summarizes available data on synthetic fertilizers, including  $Ca(NO_3)_2$ ,  $NH_4NO_3$ ,  $(NH_4)_2CO_3$ ,  $NH_4Cl$ , urea, and cyanamide. It is pointed out that  $Ca(NO_3)_2$  and  $NaNO_3$  are equally as effective per unit of N.  $NH_4NO_3$  has

been found to be quick in action and somewhat better than  $\text{NaNO}_2$  in some cases. It is much more concd. than  $\text{NH}_4$  sulfate or  $\text{NaNO}_3$ , and contains as a rule about 34.8% of N, of which one-half is in the form of  $\text{NH}_4$  and one-half nitrate N. The broad result of all the trials of cyanamide indicates that it is somewhat slower in action than  $\text{NH}_4$  sulfate and about 90% as effective as  $\text{NaNO}_3$ . H. G.

Further results of experiments on the use of nitrogenous fertilizer on pine trees two and four years old. SIEFFERT AND HELLBIG. *Forst. Zentr.* 42, 258-9 (1920); *Physiol. Abstracts* 6, 228 (1921).—The N nutrition of pines cannot be judged by the color of their needles. JOSEPH S. HEPBURN

Summary of the results of the Karlsruhe experiments on the use of nitrogenous fertilizers on pine trees, their value and position with respect to the results of foreign experiments. HELLBIG. *Forst. Zentr.* 42, 262-7 (1920); *Physiol. Abstract* 6, 228 (1921).—Sulfates are not injurious to pines, and yield good results when combined with K and phosphates. JOSEPH S. HEPBURN

Velocity of nonsymbiotic nitrogen fixation in soils of the general fertilizer series. G. C. GIVEN, G. J. KUHLMAN, JR. AND C. A. KERN. *Pa. Agr. Expt. Sta., Ann. Rept.* 1917, 405-9.—Further studies are reported on the rates of nonsymbiotic N fixation from the same plots as in C. A. 15, 287. This series does not show the distinct correlation between N fixation and fruitfulness previously observed. It is thought, however, that correlations are too numerous to be mere coincidences, and that further study may establish certain relationships. M. S. ANDERSON

Fertilizer treatment as affecting nitrate production. I. I. BALDWIN, W. E. WALTERS AND F. K. SCHMIDT. *Proc. Indiana Acad. Sci.* 1921, 295-309.—Plot expts. conducted using various manures and com. fertilizers showed in each of the treated plots greatly increased mold counts, bacterial numbers and nitrate production. Cow manure appeared to be somewhat more efficient than horse manure. The use of N with P or K was in most cases superior to either of the treatments used alone. Results with  $(\text{NH}_4)_2\text{SO}_4$ , which were least influenced by crop growth and seasonal variations, showed the greatest nitrifying power of the soil to be in May, June and July. There seems to be a general correlation, when averages are taken for the entire season, between the amt. of nitrate found in the soil under growing conditions and the amt. accumulated under optimum conditions. M. S. ANDERSON

The old and new phosphate fertilization. M. VON WRANGEL. *Arb. deut. Landw. Ges.* No. 307, 61-7 (1920); *Expt. Sta. Record* 46, 220.—The results of several series of studies are summarized which showed that crops vary widely in their ability to assimilate  $\text{P}_2\text{O}_5$  from difficultly sol. phosphates. Crops with small assimilating capacity were not particularly aided in this respect by supplementary fertilization or by varying the soil reaction, except when a distinctly acid reaction was produced. Crops with large assimilating capacity for insol.  $\text{P}_2\text{O}_5$  were independent in this respect of supplementary fertilization and soil reaction. Crops are therefore classed as  $\text{P}_2\text{O}_5$  consumers and  $\text{P}_2\text{O}_5$  dissolvers. Ash analyses of both types of crop showed about the same  $\text{P}_2\text{O}_5$  content, but the second group showed an extraordinarily high lime content. H. G.

Experiments on radioactive fertilizer. P. ANDOUARD. *J. Agr. Prat., n. ser.* 34, 470, 471, 491, 492 (1920); *Expt. Sta. Record* 45, 517-18.—Field expts. are reported with clover on 4 exptl. plats to det. the fertilizing action of a so-called radioactive fertilizer contg. 0.05% of U oxide and showing a certain amt. of radioactivity. It was found that both positive and negative results were obtained with this fertilizer. In some cases there were noteworthy increases and in other cases considerable decreases. Since the other treatments of the plats were identical no conclusions are drawn, but the expts. are to be continued. H. G.

Fertilizer experiments with iron sulfate. H. WIESSMANN. *Landw. Jahrb.* 55,



281-6(1920); *Expt. Sta. Record* 46, 522.—Expts. are reported to det. the influence of Fe sulfate on winter rye and summer barley on weak loamy sand soil. It was found that the Fe sulfate had no favorable influence on the crops and in some cases decreased the yield. No catalytic effect of the Fe sulfate was observed. H. G.

**Coal and coke ashes as fertilizers.** HEINE. *Landw. Jahrb.* 52 (1919); *Ergänzungsbl.* 1, 98-105; *Expt. Sta. Record* 46, 220-1.—Chem. analyses of coal and coke ashes showed that their compn. varied widely, but that they were uniformly deficient in plant nutrients as compared to wood ashes. They were found to contain silica, Fe, lime and S compds. Both sulfides and sulfates were present. Fertilizer expts. with these ashes on vegetable soils are reported, showing that while certain vegetables are undoubtedly sensitive to their toxic action, garden soils rich in humus may in general be profitably treated with as much as 25% coal and coke ashes some time before planting. Such treatment was found to favor plant growth and increase crop yields. The opinion is expressed that the favorable action of coal and coke ashes on acid humus soil is due to their lime content and general alky., and to their decomposing action on org. composts. H. G.

**The action of sewage fertilizer in comparison with stable manure.** O. LEMMER-MANN, K. ECKEL AND H. KAIM. *Mitt. deut. Landw. Ges.* 36, 434-8(1921); *Expt. Sta. Record* 46, 319-20.—Expts. to det. the fertilizing value of so-called humus sewage fertilizer as compared with that of stable manure are reported. The sewage fertilizer was a mixt. of 2 parts of municipal fecal sewage with 1 part of so-called humus C obtained from brown coal works. It was brown in color, of a crumby texture, and had an acid reaction. On a light loamy sand soil it always gave poorer results than stable manure as regards both the total yield and starch content of potatoes. The addn. of lime did not improve the action of either fertilizer. A comparison of the action of the N of  $(\text{NH}_4)_2\text{SO}_4$  with that of stable manure and sewage fertilizer showed that 30 kg. (about 66 lbs.) of N in the form of  $(\text{NH}_4)_2\text{SO}_4$  had about the same effect on potatoes as 68.2 kg. of N in the form of stable manure and as 135.4 kg. of N in the form of sewage fertilizer. H. G.

**Fertilizer experiments with magnesium sulfate.** O. LEMMERMANN AND H. WIESS-MANN. *Landw. Jahrb.* 55, 273-6(1920); *Expt. Sta. Record* 46, 521-2.—Expts. are reported to det. the influence of  $\text{MgSO}_4$  on winter rye and summer barley on a soil contg. 0.115% of MgO and 0.082% of CaO. The  $\text{MgSO}_4$  was applied at the rate of 400 kg. per hectare (356 lbs. per acre). It was found that such excessive fertilization with  $\text{MgSO}_4$  had no influence on the yield of the two grain crops. H. G.

**Carbon-dioxide nutrition of plants and stable manure.** GERLACH. *Mitt. deut. Landw. Ges.* 36, 147-50(1921); *Expt. Sta. Record* 46, 424; cf. *C. A.* 15, 3536.—G. reviews the work of others bearing on the subject, and reports the results of studies from which the conclusion is drawn that enriching the atm. surrounding plants in  $\text{CO}_2$  has no practical agricultural importance. The greater part of the action which animal manures exercise on crops is attributed to their content of N, potash, and  $\text{P}_2\text{O}_5$ . When stable manures were applied as top-dressings they had only a small influence on the development of crops. No evidence was obtained that stable or green manures acted as producers of  $\text{CO}_2$  which was used by crops on the field in question. H. G.

**Importance of carbon dioxide as a fertilizer for vegetables.** F. RIEDEL. *Gartenwelt* 25, No. 31, 302-4; No. 34, 336-8(1921); *Expt. Sta. Record* 45, 834.—The investigations reported, similar to those of Jess previously noted (*C. A.* 15, 1960), deal with the stimulating effect of  $\text{CO}_2$  on the growth and yield of vegetables both in the greenhouse and field. In this instance, in the greenhouse, gas-treated cucumber, tomato, bean, and cauliflower plants greatly outyielded the untreated; in the open, treated spinach and potatoes yielded more than twice the untreated. It was found that the increase due to

$\text{CO}_2$  was accentuated under conditions of high soil fertility. Applications of  $\text{CO}_2$  are said not only notably to increase the yield but also to produce a better flavored product, to shorten the growing period, and to increase the resistance of the plant to disease.

H. G.

**Changes in stable manure and methods for their prevention.** W. H. WISSELINK. *Tijdschr. Nederland. Heidemaatsch.* 33, No. 3, 81-92(1921); *Expt. Sta. Record* 45, 623.—Several expts. are described indicating the losses of nutritive constituents, especially N from stable manure during storage, by evapn., rotting, and leaching. Information is given on the use of conserving materials such as old manure,  $\text{H}_2\text{SO}_4$ , acid salts, neutral salts, lime compds., and peat. While  $\text{H}_2\text{SO}_4$  is quite effective in preventing N losses, it is considered to be dangerous for animals and for the user, and it also destroys the carbonaceous matter in the manure. The placing of old manure at the bottom of the manure pit and covering it with a layer of fresh manure has been found to be effective in preventing N losses from the latter. The  $\text{CO}_2$  gas formed by the old manure escapes through the new manure and excludes air. Part of the  $\text{CO}_2$  is said also to combine with the  $\text{NH}_3$  of the new manure, forming  $\text{NH}_4$  carbonate. Productive soil used in considerable amounts was also found to prevent N losses. Peat litter was not specially active in absorbing  $\text{NH}_3$ , and the opinion is expressed that measures should be taken to prevent the evapn. of  $\text{NH}_3$  from peat litter manure.

H. G.

**Action of rain water on the water-insoluble phosphoric acid of Thomas slag.** A. NEMEC AND F. ZLABEK. *Deut. Landw. Presse* 48, No. 12, 82(1921); *Expt. Sta. Record* 45, 624.—A brief expt. is reported which showed that when Thomas slag was exposed to the action of a heavy rain storm there was a decrease in citrate-sol. phosphoric acid and an increase in water-sol. phosphoric acid. This is attributed to the action of the  $\text{CO}_2$  in the rain water.

H. G.

**Elimination of borates from American potash.** W. H. ROSS AND WM. HAZEN. *Chem. Met. Eng.* 27, 167-70(1922).—KCl and  $\text{Na}_2\text{B}_4\text{O}_7$  occur in the brine of Searles Lake in the proportion of about 3.3 to 1. The first com. shipments of  $\text{K}_2\text{O}$  from Searles Lake contained a max. of about 20% of  $\text{Na}_2\text{B}_4\text{O}_7$ , which, when used in fertilizers, resulted in serious injury to crops. By modifying the original process of crystn. so as to bring about a rapid rather than a normal cooling of the mother liquors contg. the  $\text{K}_2\text{O}$  salts, a high-grade KCl is now being prepd. This contains less than the equiv. of 0.5% of  $\text{Na}_2\text{B}_4\text{O}_7$ , which compares favorably with the content of  $\text{Na}_2\text{B}_4\text{O}_7$  in com.  $\text{NaNO}_3$ . There no longer exists the former danger to crops from the presence of  $\text{Na}_2\text{B}_4\text{O}_7$  in fertilizers.

W. H. ROSS

**Wetting and adherent sprays.** VICTOR VERMOREL. *Prog. agr. vit.* 78, 37(1922).—Expts. show the superiority of alk. Bordeaux mixt., when rendered wetting and adherent by the addition of a small amt. of casein (20-50 g. per hectoliter) or skim milk (1 l. per 100 l.). Acid sprays and those contg. verdigris may be improved by adding a small amt. of gelatin (40-50 g. per hectoliter) or glue.

P. R. DAWSON

**The South African locust poison.** E. ANDERSON. *Union S. Africa Dept. Agr., Sci. Bull.* 15, 18 pp.(1920); *Expt. Sta. Record* 45, 756.—Investigations were conducted by A. with a view to detg. what change or changes take place when treacle or sugar is added to the locust poison used in South Africa. This poison is made by dissolving 112 lbs. of Na arsenite (80%  $\text{As}_2\text{O}_3$ ) in about 8 imperial gal. of water with the aid of heat and making the soln. up to 10 imperial gal. The hot alk. soln. is added to 24 imperial gal. of crude mill treacle, refinery treacle, or strong sugar soln. in a wooden barrel, thoroughly agitated, and then placed in metal drums of various sizes and sealed up. When these drums are opened in the field, a sludge is found to have formed in them which may have very different phys. appearances. Investigations show that both the sugar and sol.  $\text{As}_2\text{O}_3$  contents decrease on standing, and that these decreases are greatly aug-

mented by mixing the solns. while hot, since the interaction between the reducing sugar and the arsenite is very rapid when locust poison is heated to the temp. of boiling water. It was found that the treacles caused chem. change chiefly in proportion to the extent to which they contained lime and invert sugars. The results have led to the recommendation that the solns. be cold at the time of prepn., and that the more dense arsenite soln. be placed in the drum and afterwards the treacle or sugar soln., the mixing to wait until required for use. A prepared grasshopper poison that is stored in drums in California has been described by Mackie (Calif. Dept. Agr., *Monthly Bull.* 9, No. 5-6, 194-7(1920)).

**Calcium arsenate for boll weevil control, and the arsenic situation.** H. W. AMBRUSTER. *Chem. Met. Eng.* 26, 1155-8(1922).—The extent to which  $\text{Ca}_3(\text{AsO}_4)_2$  may be used in boll weevil control will depend upon the supply of As, the price and yield of cotton and the competition of other industries for the available supply. At present practically all of the As used for insecticides is obtained as a "nuisance" by-product of the smelters and is a relatively stationary quantity. The world's production of As is normally about 30,000 tons per annum, of which about 12,000 tons are produced in this country. Of the 16,000 tons consumed annually in the U. S. 80-85% is used in the insecticides and related industries. A more general use of  $\text{Ca}_3(\text{AsO}_4)_2$  as an insecticide may result in a shortage of this material unless cheap methods for utilizing As ores are developed.

K. D. JACOB

The composition and utilization of exhausted molasses in Mauritius (TEMPANY, D'AVOINE) 28. The exploitation and utilization of grape marc (VENTRE) 16. Influence of hydrogen ion on the growth of *Azotobacter* (CAINEY, BATCHELOR) 11C. Phosphoric acid production for fertilizer purposes (WAGGAMAN) 18.

BERGER, L. G. DER: *Agricultural Chemical Studies of Irrigation in Java*. The Netherlands: J. Waltman, Jr. 108 pp. Reviewed in *Expt. Sta. Record* 44, 883(1921). FRITSCH, J.: *The Manufacture of Chemical Manures*. Edited by H. B. Stocks. 2nd Ed. revized and enlarged. London: Scott, Greenwood & Son. 383 pp.

PERCIVAL, J.: *Agricultural Bacteriology*. 2nd Ed. London: Duckworth & Co. 407 pp.

STODDART, C. W.: *The Chemistry of Agriculture*. 2nd Ed. revized. New York: Lea & Febiger. 340 pp.

**Fertilizing materials from manure.** C. E. GARDAN. U. S. 1,422,434, July 11. Manure is cooked in aq. suspension under pressure to ext. fertilizing substances.

**Fungicides and insecticides.** G. RUPPRECHT. Brit. 177,517, March 21, 1922. Fungicides and insecticides consist of mixts. of S with As sulfide or Sb sulfide or both. The As and Sb compds. may be mixed with S powder or milk of S, or, preferably, are dissolved in molten S. The preps. may be sprayed upon plants in the powdered form or may be employed as vapor by heating in a transportable boiler and blowing out the fumes produced by means of a current of inert gas such as  $\text{CO}_2$ , N, or air freed from O. The degree of diln. of the vapors may be regulated by adjustment of the gas pressure.

**Arsenic compounds from alkali metal sulfides.** K. B. EDWARDS. U. S. 1,424,006, July 25. Salts of the formula  $\text{R}_3\text{AsO}_2\text{S}_2$  or  $\text{R}_3\text{AsOS}_2$ , wherein R is an alkali metal or  $\text{NH}_4$ , are prepd. by interaction of  $\text{As}_2\text{O}_3$  and an alkali polysulfide in aq. soln. The solns: obtained may be evapd. to dryness to prep. an *insecticide* in powdered form. Cf. C. A. 15, 3183.

**Alkali metal, arsenic, sulfur compounds.** K. B. EDWARDS. U. S. 1,422,945, July 18.  $\text{Na}_3\text{AsS}_4$  is formed by gradually adding  $\text{As}_2\text{S}_3$  to a soln. formed from NaS

and S. It forms white crystals with 9 mols.  $H_2O$  which can be evapd. to render them anhydrous. Other alkali metals and  $NH_4$  compds. yield similar derivs. which may be used externally as parasitocides.

**Fungicides and insecticides.** FARBENFABRIKEN VORM. F. BAYER & Co. Brit. 177,027, Feb. 25, 1921. A compn. to be added to  $H_2O$  for use as an insecticide and fungicide comprizes a mixt. of S and a sulfide of an alkali or alk. earth metal, other than CaS. The compn. may contain several such sulfides. As an example, 100 parts of BaS are intimately mixed with 30 parts of S. For use, 1.5 parts of this mixt. are added to 100 parts of  $H_2O$ , and the soln. is decanted or filtered from the pptd. matter and used for sprinkling plants.

**Lime-sulfur composition for use as an insecticide or fungicide.** M. S. HOPKINS. U. S. 1,422,977, July 18. A Ca salt of a naphthalenesulfonic acid, 1-10%, is employed with Ca polysulfide to obtain a stable dry compn. largely sol. in  $H_2O$ .

**Dry soluble lime-sulfur composition.** E. H. FRENCH. U. S. 1,423,605, July 25. A lime-S soln. is evapd. in an atm. of illuminating gas or other non-oxidizing gas in order to avoid decompn.

**Fumigating.** J. W. VAN MEYER. Brit. 178,409, Nov. 21, 1921. Poisonous gases for fumigating trees, destroying animals, etc., are generated by the action of Cl on metal particles in the presence of combustible material adapted to produce a dense smoke. Chem. agents to produce chlorocyanic or arsenical gases may also be present. The combustible material is preferably moist sawdust mixed with linseed or other oil. The Fe or other metal particles may also be coated with oil to prevent rusting, etc. A suitable app. is specified.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

Alcoholic fermentation by means of yeast cells under different conditions. III. Influence of adsorbents on the course of fermentation of different carbohydrates. E. ABDERHALDEN. *Fermentforschung* 5, 255-72(1922); cf. C. A. 16, 1788, 1787.—The fermentation of dextrose, levulose, galactose, maltose and sucrose is accelerated by adsorbents and is accompanied by the formation of AcH. Some preliminary expts. indicate that the AcH may be formed from dextrose and not by the oxidation of alc. IV. Influence of products obtained from yeast and of other substances on the course of fermentation and the growth of yeast cells. *Ibid* 273-96.—Alc. exts. and yeast autolysates accelerate the fermentation of dextrose and sucrose and the growth (increase in number) of yeast cells. R. L. STEHLE

Contributions to technical biochemistry. III. The technical utilization of asphodel root. MAX BAMBERGER, ALEXANDER JANKE AND GEORG SCHLUCK. *Oesterr. Chem. Zig.* 25, 1-4(1922).—Expts. on a lab. scale showed that the max yield of alc. was obtained when the roots were hydrolyzed by means of  $H_2SO_4$  prior to fermentation by spirit yeast XII. On a com. scale, the roots were cleansed by washing, cut, crushed, and boiled for 2 hrs. with one-half their wt. of 0.1%  $H_2SO_4$ . The resulting mass was subjected to a pressure of 75 atm.; 278 kg. of cleansed roots yielded 250 l. of liquid (mash) contg. 9% of fermentable compds. This liquid was inoculated with a pure culture of spirit yeast XII grown on asphodel mash. At intervals, fresh portions of the mash were added to the fermenting mass. On the 5th day, fermentation was stopped; distn. was carried out in a Cu still provided with indirect steam heat. The product contained 44% alc. by vol. and had the aroma of home-made wine; a second distn. over caustic lime was found advantageous. Further research is necessary to det. whether the toxic constituents of the root are present in the distillate. The toxic properties

of the root are destroyed by treatment with alkali (e. g., 0.6% soda soln.) at a low temp., and probably by the action of heat alone at a somewhat elevated temp. On account of their inulin content (10 to 17%), the roots may serve as raw material for the manuf. of diabetic food. The press cake, obtained as a by-product in the manuf. of alc., may be used as a cattle food. The gelatinous substances in the roots may be used in the manuf. of pastes.

JOSEPH S. HERRBURN

Special processes for the utilization of constituents of grains with the object of obtaining the maximum amount of products useful for food or for the industries, without exceeding in the different stages of manufacture the temperature of 65°. A. SORBT. *Bull. assoc. chim. suc. dist.* 39, 358-62(1922).—The object of these processes, developed in connection with yeast manuf., is to avoid losses of sugars used up in lactic fermentation, and those of assimilable N caused by the coagulation of proteins through high temp. In S.'s procedure the mash is acidified with vinasse which has been concd. *in vacuo* below 65°. The mixt. is held at 62° for 2-3 hrs. The distn. is carried out under reduced pressure; the vinasse is decanted from the sediment and part of it concd. *in vacuo*, while another is again mixed with the sediment and subjected to a second digestion, to be used later for acidifying. The first heat treatment of the grain is also done under a partial vacuum, the condensate being returned in order to maintain the proper diln. This method yields 36% alc. and 24% yeast on the wt. of the grain in the Vienna process, and 25% alc. with 35% yeast in the acration process.

F. W. ZERBAN

The flocculation of yeast. HEINRICH LÜERS AND KARL GEYS. *Kolloid-Z.* 30, 372-6(1922).—In the flocculation of yeast the elec. charge of the cells against that of the dispersion medium and the changes in the charge during fermentation play an important part. The causes of the charge may be found on the one hand in the physiol. nature of the cell contents. The cytoplasm is alk. in character, and hence positively charged; the nucleoplasm is acid and hence negatively charged. During mitosis the nucleoplasm gives the cell a positive charge; the rest of the time the cytoplasm makes it negative. On the other hand the external physico-chem. conditions must be considered, since the cell contents are enclosed in a semi-permeable membrane which is therefore the seat of a Donnan membrane potential whose sign is a function of the substances in the dispersion medium, particularly the H<sup>+</sup> concn. The colloids in the fermenting liquor which are adsorbed by the cell surfaces have a function in binding the cells together during flocculation. Exptl. measurements show that the yeast cells are positively charged when at rest, during fermentation and budding they become negative, and finally at the end of the fermentation become positive again, whereupon flocculation sets in. The finely divided, slowly settling type of flocculation is marked by absence of a sharp change back to positive charge, by protein hydrolysis, and a diminution of the H<sup>+</sup> concn. Viscosity measurements afford a convenient method of following the course of flocculation.

F. L. BROWNE

The fermentation of glycerol in the presence of sulfur. HANS AND LEO MÜLLER. *Helvetica Chim. Acta* 5, 628-9(1922).—The production of glycerol by yeast is well known through the researches of Neuberg. Glycerol is not appreciably fermented. Investigations of oxidation, that is, dehydrogenation by the use of S, were made. Yeast which produces but traces of CO<sub>2</sub> in the presence of glycerol alone produces large amts. in the presence of S. The process may be represented as follows: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub> + S = C<sub>3</sub>H<sub>4</sub>O<sub>3</sub> + H<sub>2</sub>S.

C. N. FREY

Composition of lees wines and of wine lees. L. SEMICHON. *Ann. fals.* 15, 201-3(1922).—The turbid wine sepd. from the marc gradually clarifies, and after a few weeks is sepd. into a racked wine and a thick residue of lees wine, which is again sepd. by decantation a few weeks later, the sludge finally yielding further wine when pressed. The compns. of the decanted and pressed lees wines are very similar. Comparison is

made with the original wine. By putting the lees from the first racking immediately through a filter press, there would be obtained a wine having practically the same compn. as the racked wine. Cf. *C. A.* 16, 2382. A. P.-C.

**Detection of watering of sweet wines.** I. ANKEN. *Mitt. Lebensm. Hyg.* 13, 183-5(1922).—The chemical and physical methods used are discussed. A microscopical method which would give more reliable results is then indicated. This method would be based on the fact that  $H_2O$  contains vegetable and animal microorganisms "the plankton" which are not found in pure wine. The method would need close study and many factors would have to be considered but A. thinks it would be of great value not only to det.  $H_2O$  in wine but in milk, etc. LILLIAN OFFUTT

**The exploitation and utilization of grape marc.** J. VENTRE. *Ann. école natl. agr. Montpellier, n. ser.* 17, 3-70(1919); *Expt. Sta. Record* 46, 509.—This is a discussion of the practical utilization of grape marc for the manuf. of alc., of the residue after distn. for the extn. of tartaric acid, the recovery and utilization of the seeds for oil, and the utilization of the residue after the removal of the seeds for feeding stuffs and fertilizers. H. G.

**Influence of wort concentration on the biological investigation of brewing water.** R. HEUSS. *Z. ges. Brauerei* 1921, 162-4, 167-70.—In testing brewing waters by incubating samples in sterile wort, with or without yeast, to ascertain if organisms are present capable of developing under practical brewing conditions, it is important that the wort used should have the same concn. as that used in the brewery. Expts. showed that light worts are more susceptible to attack by foreign organisms than worts of higher gravity. For water employed for dilg. beers after fermentation a higher standard of biological purity should be imposed than for water for ordinary brewing use. J. S. C. I.

FUCHS, W.: *Der gegenwärtige Stand des Gärungsproblems. Sonderausgabe aus der Sammlung chemischer und chemisch-technischer Vorträge.* Edited by W. HERZ. Stuttgart: Ferd. Enke. M 12.50.

HAIDE, C. VON DER AND SCHMITTHENNER: *Der Wein, Weinbau und Weinbereitung. Chemie und Untersuchung des Weines.* Braunschweig: Friedr. Vieweg. M 70. Reviewed in *Z. öffentl. Chem.* 28, 143(1922).

**Recovering glycerol from liquids resulting from alcoholic fermentation.** J. A. STREFFENS. U. S. 1,423,042, July 18. Org. materials are pptd. from distillery slop or similar liquids by the addition of an acid such as strong  $H_2SO_4$ ,  $HCl$  or  $H_3PO_4$ . The  $H_2O$  is distd. off and the residue is leached with  $H_2O$  or alc. to ext. glycerol. This is subsequently recovered from the solvent liquid by distn.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Synthetic and natural camphor.** A. L. NOTENBAERT. *Natuurwetenschapp Tijdschr.* 4, 16-20(1922).—A description of the known methods for prep. camphor from pinene and of the analytical methods for distinguishing natural and synthetic camphor. These are based on the detection of  $Cl$  which is never quite lacking in the synthetic product. R. BEUTNER

**Chemistry as an aid to the tobacco industry.** A. L. CHESLEY. *J. Ind. Eng. Chem.* 14, 817-9(1922).—Accomplishments of the chemist in connection with tobacco growers problems, and problems in the packing, labelling, and controlling of the moisture content of products are outlined. W. H. BOYNTON

**Pharmaceutical chemistry.** F. R. ELDRED. *J. Ind. Eng. Chem.* 11, 814-6(1922).—A review. E. J. C.

**Cholesterolized vaseline, a new excipient for eye ointments.** COPPEZ. *La clinique ophthalmologique*, Aug. 1921; *Repert. pharm.* 34, 7(1922).—Vaseline with which 3% of cholesterol has been incorporated is recommended as a substitute for lanolin in the prepn. of eye ointments. A. G. DUMAZ

**Qualitative and quantitative analysis of arspenamine (salvarsan) and neorsphenamine (neosalvarsan).** G. W. HOOVER AND C. K. GLYCART. *J. Assoc. Official Agr. Chem.* 5, 525-9(1922).—The recommendations made as a result of the study are: That the qual. and quant. methods submitted herewith be adopted by the Assoc. as tentative, and that they be further studied during the next year with a view to their official adoption; that the modification suggested by Engelhardt, which provides for digestion with  $\text{KMnO}_4$ , the addn. of KI, the discharge of liberated I by the use of  $\text{Na}_2\text{SO}_3$  soln. and final titration with 0.1 N I, be studied during next year; that during the next year the associate referee study and devise methods to det. the ratio of As to N in arspenamine and neorsphenamine. W. O. E.

**Determination of alcohol in drug products.** A. G. MURRAY. *J. Assoc. Official Agr. Chem.* 5, 530-9(1922).—M. recommends that the method for alc. as revized be studied for another year with the purpose of perfecting it and adopting it as a tentative method; that the Committee on Revision of the Methods be instructed to adjust Tables 7 and 8 to the same basis; that an apparent d. table with temp. corrections be substituted for the present d. table for alc.-water mixts.; or, if the Assoc. prefers to retain the present table, that explicit directions and formulas for obtaining d. from apparent wts. be introduced. W. O. E.

**Determination of chloroform in drug products.** A. G. MURRAY. *J. Assoc. Official Agr. Chem.* 5, 539-41(1922).—It is recommended that the method for the detn. of  $\text{CHCl}_3$  in drug products as outlined in this report be studied another year, with special reference to the criticisms offered by the collaborators. W. O. E.

**Determination of chloral hydrate in drug products.** A. G. MURRAY. *J. Assoc. Official Agr. Chem.* 5, 541-2(1922).—The use of chloral hydrate in medicine has almost reached the vanishing point; hence the recommendation is made that no further work be done upon this subject. W. O. E.

**Analysis of silver proteinate.** W. J. MITCHELL. *J. Assoc. Official Agr. Chem.* 5, 542-3(1922).—In a comparative study of 3 methods outlined in "New and Nonofficial Remedies, 1921" for the detn. of Ag in Ag proteinate and org. Ag compds. it was found that only the one outlined under "Protargentum-Squibb" gave in modified form correct results. Hence the recommendation is made that a further collaborative study be made of this method. W. O. E.

**Estimation of santalol in santal oil by the assay methods of the U. S. P. and by the distillation method.** C. W. HARRISON. *J. Assoc. Official Agr. Chem.* 5, 545-7(1922); cf. C. A. 16, 1636.—Since the results of the collaborating chemists showed considerable lack of agreement, the inference was drawn that the fault lies in the present procedure of acetylating the oil. It may be concluded, therefore, that since the distn. method possesses certain advantages over that of the U. S. P. and gives more accurate results on both pure and adulterated oils, it warrants further study. If the procedure of acetylating the oil can be satisfactorily solved, the method will be suitable for presentation to the Assoc. as a provisional method. W. O. E.

**Volume weight determinations of crude drugs and spices.** A. VIGNOSVIER. *J. Assoc. Official Agr. Chem.* 5, 553-7(1922).—Of the 2 methods examd.—the one similar to that adopted in grain standardization, the other involving a modified Kunz-Krause app.—one yielded varying results in the hands of collaborators, the second fairly sat-

isfactory values. The recommendation is made, however, that the study of vol. wt. detns. be continued with the assistance of collaborators. W. O. E.

**Microsublimation of plant products.** A. VIEHOEVER. *J. Assoc. Official Agr. Chem.* 5, 557-9(1922).—Expts. are described of plants yielding *santonin*, *caffeine*, *cubebin* and *hydrastine* with specially constructed app. The results obtained appear to justify further study. W. O. E.

**Identification of crude drug substitutes.** A. VIEHOEVER. *J. Assoc. Official Agr. Chem.* 5, 560-3(1922).—As a result of studies on the identification of Spanish henbane, Egyptian henbane, and false cubebs, the following recommendations were made that the modified method for the macroscopic and microscopic identification of *Digitalis thapsi* L., a recent substitute for *D. purpurea*, be adopted as tentative; that the modified method for the macro- and microscopic identification of *Hyoscyamus muticus* L., a substitute for *H. niger*, be adopted as tentative; that the method for the macro- and microscopic, and micro-chem. identification of cubebs (*Piper cubeba*) be adopted as tentative. W. O. E.

**Alkaloids.** A. R. BLISS, JR. *J. Assoc. Official Agr. Chem.* 5, 564-73(1922).—The collaborative expts. were confined to the assay of *strychnine* in tablets and liquids, the *sepn.* of *quinine* and *strychnine*, assay of *physostigma* and its preps., *fluidextract* of *hyoscyamus*, *ipecac* and its preps., together with some notes on *emetine*. In view of the results obtained, the following recommendations were made that the method for the assay of *strychnine* in tablets, including the volumetric check, be adopted as an official method; that the method for the assay of *strychnine* in liquids (in the absence of other alkaloids), including the volumetric check, be adopted as official; that the associate referee's method for the *sepn.* of *quinine* and *strychnine* be adopted as official; that the method for the assay of *physostigma* and its preps., as presented by G. W. Éwe, be adopted as official; that the method for the assay of *fluidext.* of *hyoscyamus* be adopted as official; that the study of the gravimetric and volumetric methods for the assay of *ipecac* and its preps. be continued; that the assay of *belladonna* liniment by the U. S. P. method for *fluidext. belladonnae radices* be studied collaboratively; that Éwe's method for the same purpose be likewise studied; that work be done on methods for assaying the U. S. P. ointment of *stramonium*; that work be done on methods for the detn. of *atropine*, *morphine*, *codeine* and *heroin* in tablets. W. O. E.

**Methods of analysis of morphine, codeine and heroin (diacetylmorphine).** C. K. GLYCART. *J. Assoc. Official Agr. Chem.* 5, 573-5(1922).—The collaborative results were such that it was recommended that the qual. and quant. methods for the examn. of *morphine*, *codeine* and *diacetylmorphine*, submitted at the last meeting, be adopted by the Assoc. as tentative; that these methods be further studied with a view of making them official. Cf. *C. A.* 16, 1636. W. O. E.

**Laxative and bitter tonic drugs.** H. C. FULLER. *J. Assoc. Official Agr. Chem.* 5, 575-81(1922).—The work undertaken involved the evolution of a method for assaying the anthraquinone drugs (*cascara*, *rhubarb*, *senna* and *buckthorn*) and their fluid exts. The results reported justified the recommendations that the gravimetric method evolved for assaying the anthraquinone drugs be given a more exhaustive study during the ensuing year; that conjointly with such study, the collaborative work be extended to colorimetric detns.; that the method for estg. *aloïn* be submitted to the Assoc. for study and criticism. W. O. E.

**Acetylsalicylic acid.** A. E. PAUL. *J. Assoc. Official Agr. Chem.* 5, 581-6(1922).—The results reported from a comprehensive series of expts. with this drug alone and in admixt. lead to the recommendations that the method for detg. the m. p. as given in the report be adopted by the Assoc. as tentative; that the qual. test for free salicylic



acid, as given in the report, the quant. method for salicylic acid as modified by Moraw, the I and Br methods for total salicylates, the double titration method for acetylsalicylic acid be made tentative; that A. Nutter Smith's method for free AcOH, as also any other available methods for its detn., be submitted for collaborative study by next year's associate referee; this latter applies also to the 4 immediately preceding recommendations; that consideration be given to methods for the quant. detn. of combined AcOH in acetylsalicylic acid; that the problem of detg. aspirin in the presence of possibly interfering substances be given consideration in next year's work. W. O. E.

**Methods for the determination of monobromated camphor in tablets.** C. D. WRIGHT. *J. Assoc. Official Agr. Chem.* 5, 587-9(1922).—The methods studied were those suggested by Emery (cf. C. A. 13, 2104) and Eaton (cf. C. A. 16, 613). The results reported by the collaborators, while not remarkably concordant, are sufficiently representative to indicate the degree of variation to be expected in the hands of different analysts. It was recommended that both methods be adopted as tentative, and that further study be made of Eaton's method with a view to its possible simplification. W. O. E.

**Methods for the examination of procaine (novocaine).** A. W. HANSON. *J. Assoc. Official Agr. Chem.* 5, 589-93(1922).—The method submitted last year was studied further, as well as the extn. and titration of the base from an  $\text{NH}_3$  soln. The results obtained by the different methods lead to the recommendations that the qual. tests and the bromide-bromate quant. method presented at the last meeting of the Assoc. be adopted with slight modification as tentative; that the method be studied during the next year with a view of making it official. Cf. C. A. 16, 1636. W. O. E.

**Methods for the separation and estimation of the principal cinchona alkaloids.** F. O. EATON. *J. Assoc. Official Agr. Chem.* 5, 594-6(1922).—The exptl. work, limited to quinine, cinchonidine and cinchonine, lead to the recommendation that the method outlined in the report, as also any other promising methods, be studied by the Assoc. during the next year. W. O. E.

**Differentiation of Japanese and American peppermint oils.** F. O. EATON. *J. Assoc. Official Agr. Chem.* 5, 597-9(1922).—Several color tests have been proposed to this end, but those given in the U. S. P. (1890) appear to be best. These tests have been combined and modified so as to give the max. color in the min. time. *Modified test.* Add 5 drops of the oil to 1 cc. of glacial AcOH in a small test tube and then 1 drop of concd.  $\text{HNO}_3$ . Heat the mixt. on a  $\text{H}_2\text{O}$  bath to about  $60^\circ$  in 1 to 2 min., noting the color changes. A violet or bluish color develops in *Mentha piperita* oil in a few min. when viewed in transmitted light, and a Cu-colored fluorescence in reflected light. Japanese oils usually show a straw color and sometimes a very faint blue color, but no Cu fluorescence. This test in conjunction with  $n$  and  $d$  values appears to make it possible to distinguish Am. from Japanese oils, regardless of age, rectification or manner of storage. It will not, however, indicate the admixture of such oils. The  $n$  and  $d$  values for the Japanese product are lower than for the Am. The odor and taste of Japanese oil and of improperly stored Am. oil were not so pleasant as those of the U. S. P. article. W. O. E.

**Microscopical detection of Chelidonium alkaloids.** E. KRATZMANN. *Pharm. Monatshfte* 3, 45-50, 57-66(1922).—Of the 6 alkaloids of *Chelidonium majus* 5 can be detected with certainty. The individual alkaloids mutually influence the form of their reaction crystals in high degree, so that one alkaloid with a certain reagent alone crystallizes entirely differently than when in the presence of the other alkaloids. The formation of definite reaction crystals can, therefore, be promoted by the addition of certain other alkaloids. A practical application of this procedure is cited in the case of detecting allocryptopine by the addition of chelodanone or quinine, sanguinarine

crystals were found in the root latex, without addition of any reagent, one of the few examples, if not the only one, of the occurrence of a cryst. alkaloid in the living plant. In order to facilitate the detection, K.'s inoculation method is described, whereby like vols. of the latex are very accurately measured and inoculated with minute alkaloidal additions which under the influence of the other alkaloids are pptd. in definite crystal form, and indeed in much greater quantity than in controls not inoculated. Thus, conclusions may be drawn relative to the relationship of certain crystals to definite alkaloids, and furthermore the connections between the appearance of such crystals and the influence which other alkaloids exert thereon may be more readily recognized. Limitations are inherent in the method, but further study of its application is purposed.

W. O. E.

**Examination of the fruit of *Samuela carnerosana* Trelease.** O. F. BLACK and J. W. KELLY. *Am. J. Pharm.* **94**, 477-9(1922).—The dried pods weighed 190 g. and the seeds 70 g. or approx. 70% and 30%, resp., of the dried fruit. Ether extn. of the seed gave 15 g., about 20% of the dry seeds, of a light yellow oil. It is practically tasteless and odorless and may possess medicinal properties;  $d_{20} 0.9265$ ,  $t$  no. 125.6, acid no. 5.13, sapon. value 192.83,  $n_D 1.4710$ , ester no. 187.7.  $\text{CHCl}_3$  extd. a small quantity (2 g. or about 3% of the material) of an impure, light green wax-like product, m.  $215^\circ$  (partial decompn.). Alc. dissolved out a white, amorphous solid, readily sol. in hot alc. and practically insol. in cold. It foamed strongly when shaken with water and gave other tests characteristic of a saponin but was not highly toxic. The pods were amber in color and dried to a horny consistency. The taste was sweet, but the flavor insipid. Ash 4.65%, N 0.109%, starch 4.30%, reducing sugars (calcd. as dextrose) 62.2%, non-reducing sugars (calcd. as sucrose) 3.80%. The fruit is very rich in pectinous material.

W. G. GAESSLER

**The volatile oil of *Mentha aquatica* Linné, and a note on the occurrence of pulegone.** R. F. KREMERS. *J. Biol. Chem.* **52**, 439-43(1922).—"The oil of *Mentha aquatica* Linné distd. from normal mature plants, grown with necessary cultural precautions, has been shown to consist largely of linalool acetate. Smaller quantities of another ester, of free linalool, of a free acid and of a very unstable aldehyde were also present." Pulegone, identified by  $b_p$ ,  $105-110^\circ$ ,  $n 1.484$  and semicarbazone, m.  $169-70^\circ$ , was obtained from the cohobated oil of peppermint (*Mentha piperita*). I. G.

**Local anesthetics.** HENRY GILMAN. *J. Ind. Eng. Chem.* **14**, 812-4(1922).—The prerequisites of a satisfactory local anesthetic are enumerated. The mode of synthesis of numerous compds., which are used as local anesthetics, is outlined.

JOSEPH S. HEPBURN

**Mianine.** E. O. RASSER. *Chem. Tech. Industr.* No. **31**, 745-8(Aug. 2, 1921); *Chimie et industrie* **7**, 1165(1922).—Mianine is nothing but a new name for Dakin's chloramine. A. P. C.

**The detection of alcohol in essential oils.** URZ. *Deut. Parfüm. Ztg.* **7**, 217-22(1921); *Chimie et industrie* **7**, 1175(1922).—Alc. is, after spirits of turpentine, the commonest adulterant of essential oils. It can be detected in the aq. ext. by Fleischmann's test (oxidation with  $\text{CrO}_3$  which gives a green coloration and odor of aldehyde) or Gildemeister's test ( $\text{CHI}_3$  reaction). By shaking with water in a graduate, the increase in vol. gives an idea of the amt. of alc. present. Water can be replaced by glycerol (Böttger) in which the essential oils are less sol. On treating with metallic Na, if alc. is present, H is given off and the oil thickens and turns brown (Dragendorff). On adding tannin the oil becomes viscous, and more or less hard and dirty in 3-24 hrs. On pouring adulterated oil on an aq. soln. of  $\text{CoCl}_2$  and KCNS a blue color is produced (Grassini). Fuchsin, which is insol. in essential oils, gives a red color in the presence of alc. (Puscher, Schmidt). The method can be made quant. for certain

oils, e. g., lemon oil (Leach). Dry AcOK is liquefied in contact with oils contg. alc. (Bernouilly). It is advisable to distil 10% of the oil before this test (Barbier).

A. P.-C.

**Extraction of nerol from the oil of *Helichrysum angustifolium*.** ANON. *Intern. Drog. Kosmet. Parfüm. Ztg.* 1, 10(1921); *Chimie et industrie* 7, 1174(1922).—The oil of *Helichrysum angustifolium* contains a considerable amt. of nerol esters. The oil has a  $d_{15}$  0.903–0.920, ester no. 40–65% (calcd. as nerol acetate), and dissolves in 90% alc. with pptn. of paraffin. The nerol is sepd. by esterifying with phthalic (or other dibasic) acid, dissolving in dil. NaOH, extg. the impurities by means of  $\text{Et}_2\text{O}$ , petroleum ether, etc., acidifying, extg. the acid phthalic esters, saponifying, and rectifying the alcohols *in vacuo* or by steam distn. To eliminate geraniol the prepn. of neutral esters and fractional distn. are recommended.

A. P.-C.

**Chrysanthemum powder.** DOMENICA COSTA. *Giorn. chim. ind. applicata* 4, 251–3(1922); cf. *C. A.* 16, 2573.—Aq. exts of *Chrysanthemum cinerariaefolium* have higher values than exts. obtained by 98% alc. or  $\text{Et}_2\text{O}$ . Av. values for aq. exts. were 22–25% for closed flowers, 12–14% for opened flowers, and 9–11% for stems, calcd. upon wt. of powder after deducting loss at 100°. The app. used consisted of a 100-cc. bell jar in the neck of which was a rubber stopper provided with a siphon tube of inside diam. not over 2 mm. and bent twice at right angles, the outer end being provided with a piece of rubber tubing and pinchcock. Next to the rubber stopper in the bell jar is placed a piece of cotton to prevent particles of the material passing through into the ext. Put 10 g. of the material, coarsely ground in a coffee mill, upon the cotton, place another thin layer of cotton upon the substance, and then fix a piece of silk cloth over the large end of the bell jar by an elastic band. Place the jar in a beaker contg. 200 cc.  $\text{H}_2\text{O}$  at 15–17°, aspirate through the siphon to fill the bell jar with  $\text{H}_2\text{O}$ , and, closing the pinchcock, allow the app. to ext. for 12 hrs. Siphon off 100 cc. of the liquid, replace in the beaker by another 100 cc. of  $\text{H}_2\text{O}$ , allow to ext. 12 hrs. more, remove another 100 cc. similarly, and repeat the operation once more, to have finally 300 cc. ext., the powder being then almost completely extd. The 3 portions collected are all limpid, dull brownish red in color and of an odor resembling tea. Evap. and dry at 100°. The dry ext. is always of dark brown color, with an odor of burnt sugar and slightly aromatic, of solid consistency, and fragile and easily powdered. For analysis of *insecticide powder*, use, in place of the bell jar, a cylindrical separatory funnel with stopcock. Place a little plug of cotton on the bottom next to the stopcock, then a layer about 1 cm. thick of pure pumice powder, then 10 g. chrysanthemum powder previously mixed in a mortar with 10 g. finely powdered, washed and dried pumice, cover with pumice and then with cotton. Slowly pour into the funnel 200 cc.  $\text{H}_2\text{O}$ , allow to rest 12 hrs., remove 100 cc. of the liquid by the stopcock, replace by another 100 cc.  $\text{H}_2\text{O}$ , and repeat this extn. twice more. Proceed then as above.

ROBERT S. POSMONTIER

**Incompatibility of quinine salts with aspirin and resorcinol.** D. GANASSINI. *Giorn. chim. ind. applicata* 4, 265(1922).—Quinine and aspirin (as found from expts. *in vitro* and on rabbits) may be associated, since formation of salts of quinotoxine was not discovered. Quinotoxine is formed only with impure aspirin by  $\text{AcCl}$ . A definite physical, chem. and therapeutic incompatibility exists between quinine and resorcinol. Mixts. of these become rapidly yellow, green and often pasty, and in certain cases the presence of quinine cannot be detected any more.

ROBERT S. POSMONTIER

**Preparation of Unguentum hepatis sulfuris.** E. HØST MADSEN. *Arch. Pharm. Chem.* 29, 150–8(1922).—In prepg. this salve the mixt. should not be alk. when the  $\text{Zn}(\text{OH})_2$  is added. Slight alky. gives a product which irritates the human skin. The method used in prepg. the polysulfide is not in itself important. It is best to use a soln. contg. 46–7% KOH. A hematin soln. (hematin 0.2 g., alc. 25 cc.,  $\text{H}_2\text{O}$  75 cc.) serves

very well to ascertain the permissible limit of alky. Equal parts of this soln. and the liquid to be tested are mixed; they should not change color. Expts. show that this reagent gives dark colors when an  $\text{OH}^-$  concn. of 0.006 is exceeded. In the hydrolysis of the polysulfides this color change begins when the monomol. reaction const. reaches 0.0015.

A. R. ROSE

**Ergot.** A. STOLL. *Schweiz. Apoth. Ztg.* 60, 341-6, 458-64, 374-83(1922); cf. C. A. 16, 2386.—The history, mode of prepn. and properties of *ergotamine* (*E*) are given; *gynergen*, Sandoz, is its tartrate. To prep. *E*, first ext. ergot moistened by soln. of  $\text{Al}_2(\text{SO}_4)_3$  with  $\text{Et}_2\text{O}$  or  $\text{C}_6\text{H}_6$ . This yields 35-40% of alkaloid-free oil of ergot, contg. plant acids, phytosterol, coloring matter, etc. Now add a base and again ext. with  $\text{Et}_2\text{O}$  or  $\text{C}_6\text{H}_6$ ; upon evapn., *E* is formed; the yield varies from 0.01-0.2%. From aq. acetone soln., efflorescent crystals form; they contain  $2\text{Me}_2\text{CO}$  and  $2\text{H}_2\text{O}$ . Salts of *E* turn brown at  $140^\circ$ ; *E* m.  $180^\circ$  with decompn., turning brown. *E* in alc. soln. upon standing is converted into the isomeric *ergotaminine* (*B*); it is less basic, less active, and very little sol. in org. solvents ( $\text{MeOH}$ ,  $\text{EtOH}$ ) except pyridine and  $\text{AcOH}$ . The change of  $[\alpha]_D = -155^\circ$  for *E* in 0.6%  $\text{CHCl}_3$  soln. to  $+381^\circ$  for *B* in the same soln. is notable, and the change of *E* into *B* is reversible. *E* is very unstable towards  $\text{O}$  of the air. The chem., phys. and physiol. properties of *E* and *B* are tabulated and compared with those of the analogous ergotoxine and ergotinine.

S. WALDBOTT

**Notes on ash yield of buchu.** E. L. NEWCOMB. *J. Am. Pharm. Assoc.* 10, 849-50 (1921).—Twenty samples of buchu were studied, some of which were purchased underground, some in powd. form, and some being the ground stems from the garbled drug. The ash ranged from 3.14 to 5.17%. The  $\text{HCl}$ -insol. ash ranged from 0.16 to 2.11%. One specimen gave 8.8% of stems on garbling. The present U. S. P. limit of 10% for stems is satisfactory. The ash limit of 4% for ash is a little too stringent.

L. E. WARREN

Philippine essential oils (WEBB, BROWN) 26. Commercial, industrial and economic index of chemicals and drugs (ANON.) 13.

ARENDT AND KELLER: *Neue Arzneimittel und pharmazeutische Spezialitäten einschliesslich der neuen Drogen, Organ- und Serumpräparate mit zahlreichen Vorschriften zu Ersatzmitteln und einer Erklärung der gebräuchlichsten medizinischen Kunstausdrücke*. 6th revized and enlarged ed. Berlin: J. Springer. Bound M 66.

GARRIGUES, A.: *Plants in Medicine: Rye and Ergot*. Paris: Libr. Octave Doin. 254 pp.

LAZENNEC, I.: *Manuel de parfumerie*. Paris: J. B. Baillière et Fils. 281 pp. fr. 8. Reviewed in *Nature* 109, 774(1922) and *Rev. prat. chim.* 25, 366(1922).

**Arsphenamine derivatives.** BOOT'S PURE DRUG CO., LTD. and L. ANDERSON. *Brit.* 177,283, Jan. 7, 1921. A neutral sol. compd. of glucose with the free base of arspenamine is prepd. by dissolving the base in alkali, adding glucose, mixing, and finally neutralizing with  $\text{HCl}$ . The resulting soln. may be employed as such for therapeutic use, or the compd. may be isolated by pptn. by alc., acetone, etc. The product may also be prepd. by warming a suspension of the base in glucose soln., or according to the provisional specification, by dissolving the base in  $\text{HCl}$ , mixing with glucose, and then neutralizing with  $\text{NaOH}$ .

**Therapeutic arseno-stibino compounds.** C. N. MEYERS. U. S. 1,422,294, July 11. Equimol. proportions of the Na salts of arsenic and antimonie acids are added to a cold aq. soln. of  $\text{Na}_2\text{S}_2\text{O}_4$  and the mixt. is heated to about  $68^\circ$  and maintained at this

temp. for about  $1\frac{1}{2}$  hrs. to allow sepn. of the complex arseno-stibino base formed which is filtered off while protected by an atm. of inert gas.  $MgCl_2$  may be used with the  $Na_2S_2O_4$  soln. The Na salts used as starting materials may be formed from  $3,4-O_2N-(HO)C_6H_3AsO_3H_2$  and  $3,4-O_2N(HO)C_6H_3SbO_3H_2$  or the corresponding derivs. in which H, alkyl, acyl, sulfoxylate or other substituents replace the  $O_2$  of the nitro group. The dihydrochloride of the arseno-stibino base is obtained by the action of a MeOH soln. of HCl on the base.  $3,4-H_2N(HO)C_6H_3As : SbC_6H_3(OH)NH_2(4,3) \cdot 2HCl$  is a brownish yellow amorphous powder which readily forms a Na salt. When treated with Na sulfoxylate, this dihydrochloride forms a sulfoxylic compd. in which both HCl groups are split off and one  $NH_2$  is replaced by the complex  $NHCH(OH)SONa$ . These compds. are trypanosomicides adapted for therapeutic use.

### 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**The technical synthesis of nitric acid by means of gaseous explosions.** F. HÄUSSER. *J. Soc. Chem. Ind.* **41**, 253-9R(1922).—The method of calcg. NO concn. in a heated  $N_2 : O_2$  mixt. is developed and it is shown that while NO concn. obtained by heating such a mixt. by explosion in a small bomb agree with the theoretical figures, when the bomb size is increased the NO concn. rises to more than double the theory. The exptl. plant is described and well illustrated. The use of  $O_2$  in the bombs has been abandoned. Bombs of 100 and 300 l. have been tried, the larger bomb giving a yield 50% in excess of the smaller, or 96-107 g.  $HNO_3$  per  $m^3$  coke oven gas of 4000 cal. per  $m^3$ . The exit gas contains 0.6-0.7% NO by vol. from which a 28%  $HNO_3$  soln. was obtained. Even larger bombs seem easily feasible to construct, and the use of a liquid fuel is predicted. A mathematical method of calcg. the oxidation space for NO is developed and the very favorable effect of pressure on reducing its size is shown. (Cf. *C. A.* **15**, 3542).

F. C. Z.

**The U. S. government explosives plant C, Nitro, West Virginia. III. The manufacture of nitric acid.** MARCH F. CHASE. *J. Ind. Eng. Chem.* **14**, 677-81(1922).—The article is of a general nature, but contains several good diagrams and illustrations. A typical distn. curve is also shown. (Cf. *C. A.* **16**, 1867, 2389.)

F. C. Z.

**Contribution to the study of the peroxidation of nitric oxide and of the recovery of nitrous gases.** I. E. BRINER, S. NIEWIAZSKI and J. WISWALD. *J. chim. phys.* **19**, 290-309(1922).—Absorption of a mixt. of NO and  $NO_2$  by an alk. soln. yields only nitrites. This confirms the theory of Leblanc that although in the equil. mixt.,  $NO + NO_2 \rightleftharpoons N_2O_3$ , the concn. of  $N_2O_3$  is very minute, the latter is absorbed by the alk. liquid and a new equil. is rapidly established. Thus the absorption appears to be one of  $N_2O_3$  alone. The authors have slowed down the above reaction velocity by diln. with  $N_2$  and this  $N_2O_3$  is absorbed and also  $NO_2$  reacts with the absorbent in appreciable amts. This latter reaction is proved by the formation of nitrates,  $NO_2$  being absorbed as nitrite and nitrate in equivalent amounts. In the recovery of nitrous gases it is, therefore, of advantage to have high concns., for with increasing diln. NO and  $NO_2$  behave more and more independently of each other and the effluent gases may carry considerable NO. Another obvious advantage is to have  $NO_2$  in at least slight excess over NO. The formation of peroxide at low temp. is direct from NO and  $O_2$  and does not involve an intermediate step  $N_2O_3$ . Temp. of solid  $CO_2$  and of liquid air are favorable to the formation of  $NO_2$  and to the recovery of nitrous oxides by alkaline liquids.

JAMES M. BELL

**Concentrating dilute nitric acid solutions.** C. D. CARPENTER and JOSEPH BABOR. *Chem. Met. Eng.* **27**, 121-4(1922).—It is pointed out that the figures reported in a

previous article (cf. *C. A.* 16, 1489) were erroneous. Corrected figures show that the wt. %  $\text{HNO}_3$  in the liquid and vapor phases are, resp., 10.0, 0.20; 20.0, 1.05; 30.0, 4.10; 40.0, 12.00; 50.0, 26.50; 60.0, 47.80; 65.0, 60.80. Curves show the rate of concg. dil.  $\text{HNO}_3$  solns. F. C. Z.

**Intensive systems of sulfuric acid manufacture.** WM. MACNAB. *Chem. Age* (London) 6, 872(1922).—K. B. Quinan has erected a chamber plant in S. Africa, consisting of a Glover tower, a "converter" tower (cf. U. S. pat. 1,355,357 (*C. A.* 15, 150)) 9' diam.  $\times$  10' high, and 2 Gay-Lussac towers in series. Hot burner gas passing through the Glover concentrates the acid supplied it from 66% to 78–80%  $\text{H}_2\text{SO}_4$ . The gas at 80° enters the converter tower where its  $\text{SO}_2$  is converted to  $\text{H}_2\text{SO}_4$  through the medium of N oxides supplied in acid from the Gay-Lussacs used as feed for this tower. The residual acid is free from N oxides and the residual gas free from  $\text{SO}_2$ , through contg. the N oxides originally in the acid. These oxides are absorbed in the Gay-Lussac in the usual way. The converter tower consists of a shell containing several perforated plates (like a sieve-plate distg. column) through which the gas passes so rapidly as to hold up the acid on the plate. This runs down through overflow pipes. The capacity of the plant is 2 tons 66° acid per hr. The erection costs are cheaper than for a regular chamber plant, though gas blowing and acid pumping cost more. F. C. Z.

**The solution of lead in sulfuric acid concentration.** A. FRISAK. *Mettall. u. Erz* 19, 200–201(1922).—The soly. of  $\text{PbSO}_4$  in  $\text{H}_2\text{SO}_4$  of various concns. and temps. is given graphically. An actual curve of lead present during concn. follows the exptl. curves fairly closely. It is calcd. that a pan using 3 tons of acid in 24 hrs. would lose 0.27 kg. of lead per day. R. S. DEAN

**New Glover tower construction.** HUGO PETERSEN. *Chem.-Ztg.* 46, 628–9(1922).—Instead of making the tower of increasing inside diam. toward the top the side walls are straight and thinner than usual. The grid supporting the packing is of standard brick instead of plates and the packing is Petersen's prismatic blocks (Ger. pat. 209,681). The distributor is Ozag-Petersen's mech. device. This construction decreases the original cost considerably. F. C. Z.

**Tank cars for transportation of muriatic acid.** J. M. ROWLAND. *Chem. Age* (N. Y.) 30, 299–301(1922).—A tank car has been built with four vertical cylindrical tanks, made of wood lined with unvulcanized para rubber, with a total capacity of 35 tons of 21° Bé.  $\text{HCl}$ . The vertical cylindrical shape affords economy in construction, keeps all metal on the outside of the wood, keeps the joints between staves vertical, and secures the largest bearing area for the tank load. Each tank cover has a permanent built-in siphon extending into a well in the bottom of the tank, also a vent, measuring well and manhole. Each car has a permanent siphon priming app. allowing unloading simultaneously of all 4 tanks without the necessity of opening any tank, without fume, and without priming liquid. W. H. BOYNTON

**Progress in phosphoric acid production for fertilizer and food purposes.** WM. H. WAGGAMAN. *Chem. Age* (N. Y.) 30, 302–5(1922).—Where cost of fuel or energy required to produce the unit of  $\text{H}_3\text{PO}_4$  is no greater than the cost of  $\text{H}_2\text{SO}_4$  necessary to effect the same results, the pyrolytic process with  $\text{SiO}_2$  replacing  $\text{H}_2\text{SO}_4$  has many advantages. The furnace method is described and some costs are given. Advantages of this process include: the formation of by-products with value as fertilizer, the ability to use run-of-mine phosphates inherently unfit for acid phosphate production, and the ability to produce an acid of higher purity. Fuel smelting is economically more efficient than elec. smelting at the present cost of power. W. H. B.

**Accidents observed in the synthesis of ammonia at high pressures and means of avoiding them.** GEORGES CLAUDE. *Compt. rend.* 174, 157–9(1922).—Excessive pressure due to the difference of temp. between the internal and external layers of the

reaction chamber for synthesizing  $\text{NH}_3$  by the Claude process may be avoided, and danger of bursting of the walls reduced by surrounding the entire chamber with an appropriate heating coil and immersing it in a mass of infusorial earth. W. H.

Potash in America—two years progress. JOHN E. TERPILS. *J. Ind. Eng. Chem.* 14, 787-8(1922). E. J. C.

Developments in nitrogen fixation. J. M. BRAHAM. *J. Ind. Eng. Chem.* 14, 791-2(1922). E. J. C.

Nitrogen fixation by the cyanide process. F. E. BARTHELL. *J. Ind. Eng. Chem.* 14, 699-704(1922).—The Bucher process of cyanizing  $\text{Na}_2\text{CO}_3$ , as carried out experimentally at Greene, R. I., is described. Several illus. are given, as well as curves of exptl. results. Cost estimates for a 5 ton  $\text{NH}_3$  per day plant are included. F. C. Z.

The manufacture and applications of peroxide of hydrogen. H. WILSON. *J. Soc. Dyers Colour.* 38, 139-42(1922).—A discussion of the products obtained by the various methods of manuf. Wool and cotton are bleached in a soln. contg. 5 g. 30%  $\text{H}_2\text{O}_2$  per l., wool at 40-50° and cotton at 60-65°. Straw and horn are bleached in a soln. contg. 20-30 g. 30%  $\text{H}_2\text{O}_2$  per l., horn at 35° and straw at 80°. C. E. M.

The graphite industry of Madagascar. A. D. LUMB. *Bull. Imp. Inst.* 20, 61-8(1922). A. P.-C.

Carbon black—its manufacture, properties and uses. R. O. NEAL AND G. ST. J. PERROTT. Bur. of Mines, *Bull.* 192, 95 pp.(1922).—A comprehensive sketch of the history, manuf., properties and uses of C black. The channel, small rotating-disk, plate or Cabot, and roller or rotating-cylinder processes are described and compared. Phys. and chem. tests and specifications are given. Other methods than the combustion of natural gas are discussed and patents relating thereto reviewed. Numerous tables and illustrations and a complete bibliography are included. W. H. BOYNTON

Up-to-date methods in a bleaching powder plant. G. L. MONTGOMERY. *Chem. Met. Eng.* 26, 1038-42(1922).—Largely a description of physical equipment of a plant in which "the succession of operations has been made as nearly automatic as possible."

R. L. BROWN

Vegetable glue. C. K. REIMAN. *J. Ind. Eng. Chem.* 14, 799-800(1922).—Vegetable glue consists of a homogeneous mixt. of starch, water, and  $\text{NaOH}$  or similar solvent. They are prepd. hot, are used cold, and produce a joint as strong as animal glue. The greatest application is in the veneering industry. Starch properly cooked with caustic requires no preliminary treatment with dil. acid or an alk. oxidizing agent, and by the addn. of certain colloidal materials a product as strong as animal glue is obtained when 4 or more parts of water are added to the starch and caustic. Variation in the grades of starch necessitates accurate chem. control to produce a uniform product.

W. H. BOYNTON

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Rapid estimation of  $\text{Na}_2\text{SO}_4$  in commercial salt cake (MATSUI, KIMURA) 7.

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BREUER, CARL: *Kitte und Klebstoffe*. 2nd revized & enlarged ed. Leipzig: M. Jänecke.

KEMPTON, P. H. S.: *Industrial Nitrogen*. Kingsway, London, W. C.: Sir Isaac Pitman & Sons, Parker St. 2s. 6d. Reviewed in *Chem. News* 124, 386(1922).

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Phosphoric acid. E. W. GUERNSEY and J. Y. YEE. U. S. 1,422,699, July 11. Phosphate rock, sand and coal are mixed in such proportions that the mol. ratio of the combined  $\text{CaO}$  to the  $\text{SiO}_2$  will be 1 : 1, and the mixt. is formed into briquets and heated to a temp. of incipient clinkering to expel the P. This is oxidized and the oxides are recovered for acid production.

**Chlorosulfonic acid.** T. L. BRIGGS. U. S. 1,422,335, July 11. Sulfuric "contact gas" and dry HCl are separately led to a mixing chamber in controlled vols. and the resulting chlorosulfonic acid vapors with associated products are led off through a long restricted passage to a recovery receptacle.

**Sulfur burner.** H. D. WELLS. U. S. 1,422,801, July 11. The app. comprizes a horizontal rotating shell mounted within a casing, around which the S is burned.

**Synthetic ammonia.** SOC. CHIMIQUE DE LA GRANDE-PAROISSE, AZOTE ET PRODUITS CHIMIQUES. Brit. 177,777, March 21, 1922. The reaction tube for the catalytic synthesis of  $\text{NH}_3$  under high pressure is made of low-C Fe, *e. g.*, 0.018, S 0.09, C 0.098, Mn 0.93. It is necessary to provide the part of the tube subjected to the highest temp. with sep. strengthening rings or a sleeve made of resistant metal. Cf. 174,041.

**Nitrogen; hydrogen; ammonia.** SOC. CHIMIQUE DE LA GRANDE-PAROISSE (Azote et produits chimiques). Brit. 177,494, Feb. 17, 1922. Gaseous mixts. of N and H intended for the catalytic synthesis of  $\text{NH}_3$  under high pressure are purified of any CO and O by passing the compressed gases over a catalytic material having a basis of Fe at a temp. below that required for the production of  $\text{NH}_3$ , *e. g.*, 400–450°. The catalyst may be the spent or fresh material employed for the  $\text{NH}_3$  synthesis, operating in a catalyzing tube for the same manuf., *e. g.*, that described in 174,041, but not necessarily having the inner tube thermally insulated. Water produced is condensed and sepd. before the gases pass to the  $\text{NH}_3$ -producing app.

**Nickel catalyst.** E. WEINTRAUB. U. S. 1,423,978, July 25. A fibrous supporting material such as "fibrox" is permeated with Ni carbonyl under subatm. pressure and the material is then heated to the decomp. temp. of the carbonyl to prep. a catalyst for ammonia synthesis.

**Lead oxides.** G. SHIMAZU. Brit. 176,924, Dec. 30, 1920. Litharge is produced by the autoxidation of very finely divided Pb. The Pb is first powdered by putting Pb balls into drums slowly revolving at, *e. g.*, 25 r. p. m. The oxidation is started by moisture or heat and then proceeds of itself; more Pb powder is added at a proper rate. The litharge can be converted into red lead according to known practice by heating in a furnace or pan at a temp. below 500°. Cf. C. A. 16, 1300.

**Phosphates.** RHEINLAND VEREIN CHEMISCHER FABRIKEN AKT.-GES. ZWEIF-NIEDERLASSUNG MANNHEIM and F. RÜSBERG. Brit. 177,496, Feb. 20, 1922. Addition to 174,370 (C. A. 16, 1838). A mixt. of crude phosphate, and a loosening substance is treated with HCl gas. Then alkali sulfate is added to convert the  $\text{CaCl}_2$  formed into gypsum. The addition of an indifferent substance, such as sand, gypsum, infusorial earth, or dry brown coal to the mixt. of phosphate and loosening substance prevents caking during the course of the reaction.

**Pyrosulfates.** BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD. Brit. 177,310, Jan. 20, 1921. The pyrosulfates of the alkali metals and of  $\text{NH}_3$  may be prepd. in a powdered form by heating the corresponding bisulfates or a mixt. of the sulfate with  $\text{H}_2\text{SO}_4$  to 200–300° (preferably about 250°) under reduced pressure and with agitation. The temp. at the end of the reaction is kept below the m. p. of the product, so that the latter solidifies and is broken up by the agitator. The heat is conveniently applied by an alternating current between carbon electrodes.

**Retort for alkali metal cyanide manufacture.** F. J. METZGER. U. S. 1,422,878, July 18. The retort is formed of Fe or similar metal which is corrodible at high temps. by the action of the gases in contact with the retort and corrosion is prevented by a protecting layer of Ni-Cr alloy which resists the action of the gases. Cf. C. A. 16, 416.

**Treating silicates; alkaline sulfates.** E. LEVITT. Brit. 177,736, June 9, 1921. See U. S. 1,399,216 and Can. 214,636 (C. A. 16, 798).

**Treating alunite.** W. GLAESER. U. S. 1,422,848, July 18. Alunite is heated



to 700–800° with steam and  $\text{CaCl}_2$  to produce  $\text{HCl}$ , and  $\text{KCl}$  is leached from the residue.

**Aluminium chloride.** H. D. GIBBS. U. S. 1,422,580, July 11. Al is treated with liquid Cl at a temp. below 0° (preferably about –33°) in order to form  $\text{AlCl}_3$ .

**Aluminium chloride.** F. W. HALL. U. S. 1,422,568, July 11.  $\text{AlCl}_3$  is prepd. by blowing powdered  $\text{Al}_2\text{O}_3$  into an atm. of heated Cl and S. Cf. *C. A.* 16, 1135.

**Aluminium and potassium chlorides.** G. A. BLANC. Brit. 176,770, Feb. 15, 1922.  $\text{AlCl}_3$  and  $\text{KCl}$  are sepd. from solns. of leucite in  $\text{HCl}$  by the following cyclic process. A hot, highly satd. soln. of leucite in  $\text{HCl}$  is cooled to atm. temp., when most of the  $\text{KCl}$  crystallizes and is removed. The liquor is then treated with gaseous  $\text{HCl}$  either by spraying the liquor into the gaseous  $\text{HCl}$  or by passing the latter into the mother liquor. The  $\text{AlCl}_3$ , which is thereby pptd., is removed, and the mother liquor is used for treating fresh quantities of leucite.

**Alums.** ÉTABLISSEMENTS MÉTALLURGIQUES DE LA GIRONDE. Brit. 178,400, June 28, 1921. Al turnings, powder, and other forms of waste Al metal are dissolved in  $\text{H}_2\text{SO}_4$  satd. in the cold with alum and  $\text{NH}_4$ , K, or Na sulfate is added to give the corresponding alum. The alkali sulfate may also be added prior to the dissolution of the Al. Alternatively, the Al waste may be dissolved in an alkali soln. satd. in the cold with alum, and the calcd. quantity of  $\text{H}_2\text{SO}_4$  then added. After the reaction, the alum is sepd. by crystn.

**Potassium chloride from bitters.** I. F. HARLOW. U. S. 1,422,571, July 11. A bittern contg.  $\text{K}_2\text{CO}_3$  and Na salts concd. to approx. satn. is treated with  $\text{CaCl}_2$  in proportion chem. equiv. to the K present and heated to 95° to ppt.  $\text{CaCO}_3$  and leave the K in soln. as  $\text{KCl}$ . The soln. is then concd. to 0.75 its former vol. to effect crystn. of Na salts while the soln. is still hot and after sepn. of these salts the soln. is cooled to about 20° to obtain  $\text{KCl}$ .

**Magnesium carbonate.** T. SIMON. Brit. 176,785, March 7, 1922.  $\text{MgCO}_3$  is prepd. from dolomite by treating a suspension of the burnt dolomite in  $\text{H}_2\text{O}$  or alkali carbonate soln. with  $\text{CO}_2$  under ordinary, diminished, or increased pressure, the proportion of burnt dolomite being so adjusted that "in the treatment the  $\text{MgO}$  in the dolomite is always present as a deposit." In an example, 100 kg. of burnt dolomite are mixed with 1,500 l. of  $\text{H}_2\text{O}$ , and treated with  $\text{CO}_2$  under pressure. The mixt. is filtered, and about 70 kg. of hydrated  $\text{MgCO}_3$  is obtained from the filtrate by heating.

**Ammonia-soda process.** E. E. ARNOLD and P. ST. CLAIR, JR. U. S. 1,423,510, July 25. Compressed  $\text{CO}_2$  is expanded in heat interchanging relation to, but out of contact with, ammoniated brine to absorb the heat generated by the reactions in producing  $\text{NaHCO}_3$ .

**Ferrous sulfate; hydrochloric acid.** E. V. CHAMBERS, T. C. HAMMOND and W. SOWDEN. Brit. 177,444, June 14, 1921. Waste  $\text{FeCl}_2$  liquors are heated with  $\text{H}_2\text{SO}_4$  to obtain  $\text{FeSO}_4$ , and the  $\text{HCl}$  and steam evolved are condensed. A suitable app. is specified.

**Bag for packing bleaching powder.** GENZÔ YAMAGA and the KWANTÔ SANSÔ KABUSHIKI KAISHA. Japn. 39,704, Aug. 30, 1921. A bag made of cotton duck or other strong cloth is painted with cellulose soln. and then immersed in a melted mixt. of 50% petroleum pitch, 20% rape oil and 30% heavy oil. The bag is resistant to Cl and prevents the penetration of moisture.

**Hyposulfites and formaldehyde sulfoxylates.** MASAJI FURUKAWA and the KWANTÔ SANSÔ KABUSHIKI KAISHA. Japn. 39,633, Aug. 20, 1921. Sol. Ni or Fe salts are used as a catalyzer in the reduction of  $\text{NaHSO}_3$  or  $\text{NaHSO}_3 \cdot \text{CHOH}$ . E. g.,  $\text{Na}_2\text{S}_2\text{O}_4$  is formed from 100 parts of  $\text{NaHSO}_3$  of 30° Bé., 0.1 part of  $\text{NiSO}_4$ , 10 parts of Zn dust and small quantity of  $\text{H}_2\text{SO}_4$ , and  $\text{NaHSO}_3 \cdot \text{CHOH}$  from 100 parts of  $\text{NaHSO}_3$  of 35° Bé., 23 parts of 38%  $\text{H}_2\text{SO}_4$ , 15 parts of Zn dust and 0.1 part of  $\text{NiSO}_4$ . Sulfates, sulfites, hydrogen

sulfites, acetates, oxalates, carbonates or hydroxides of Ni and Fe may also be used as the catalyst.

**Hydrogen; carbon monoxide; sulfur compounds.** NORSK HYDRO-ELEKTRISK KVARLSTOFAKTIESELSKAB. Brit. 176,779, Mar. 3, 1922.  $\text{CO}_2$  or water-vapor or a mixt. of the two is made to react with a S-contg. gas in the elec. arc. With  $\text{CO}_2$  the products are  $\text{CO}$ ,  $\text{SO}_2$ , and small quantities of other compds.; with water-vapor,  $\text{H}_2$ ,  $\text{SO}_2$ , and  $\text{H}_2\text{S}$  are obtained. The mixt. is freed from S compds.,  $\text{H}_2\text{O}$ , and  $\text{CO}_2$ , leaving  $\text{H}_2$ ,  $\text{CO}$ , or a mixt. thereof. As sources of S, free S and pyrites are mentioned; in the latter case the procedure is to melt the pyrites in an elec. furnace, thus liberating one-half of its S, and then to electrolyze it for the remainder. The Fe thus obtained may be purified.

**Sulfur.** BADISCHE ANILIN & SODA FABRIK. Brit. 177,103, July 11, 1921. Finely divided or colloidal S is obtained by evapn. of  $\text{NH}_4$  polysulfide soln. in presence of a protective colloid. Various protective colloids, or waste materials containing them, may be used, e. g., saponins, gelatin, casein, sodium lysalbinat, waste sulfite liquor, naphthol pitch, and glycerol foots. Evapn. of the soln. may be continued until evolution of  $\text{NH}_3$  and  $\text{H}_2\text{S}$  is complete, or the soln. remaining after the removal of part of these gases may be neutralized with acid and then treated with an oxidizing agent, when the S liberated from the  $\text{H}_2\text{S}$  is also obtained in the colloidal state.

**Treating liquids with sulfur dioxide.** F. M. ALLEN. U. S. 1,422,327, July 11. Air under pressure not greatly above atm. pressure is introduced into a relatively small chamber contg. molten S and by controlling the velocity of the air the temp. of the gases led from the chamber is maintained at about  $288^\circ$ . The sulfurous gases are led into liquors for producing  $\text{Al}_2(\text{SO}_4)_3$  or other liquid to be treated.

**Revivifying decolorizing carbon.** J. N. A. SAUER. Brit. 177,180, June 20, 1919. Decolorizing carbon is revived after use by treatment with an acid other than  $\text{H}_2\text{SO}_4$ , followed by washing. For instance, it may be boiled for an hr. or more with 2%  $\text{HCl}$ . When after several revivifications such a treatment fails to revivify, the C is treated to a reburning process of a known kind either before or after an acid treatment of the kind described; and where the reburning follows the acid treatment, a second acid treatment may be applied after the burning. Cf. C. A. 16, 800.

**Carbon black from bituminous sands.** A. S. COOPER. U. S. 1,423,193, July 18. Brown bituminous sands are ground, bitumen is blown from them and the finely comminuted bitumen thus obtained is heated to obtain C black.

**Purifying decolorizing carbons.** V. LENHER and F. M. DORSEY. U. S. 1,423,231, July 18. Carbonized material such as decolorizing C which may be used for filling gas masks is purified or activated by treatment with Se oxychloride, washing with  $\text{CCl}_4$ , and evapng. the residue of the latter from the material.

**Removing toxic and harmful gases from air.** A. B. LAMB. U. S. 1,422,211, July 11. The gas mixt. is passed through drying material, then through active charcoal, then through heated "hopcalite" (described in U. S. pat. 1,345,323 by Frazer and Scalione; C. A. 14, 2533) and is then filtered and cooled. The treating chemicals may be packed in canisters and the heating may be effected by a portable elec. device.

**Coated fabrics; phenol-acetaldehyde condensation products.** A. E. ALEXANDER. Brit. 176,828, Oct. 12, 1920. Fibrous material such as cardboard or woven fabric is impregnated and coated with a condensation product of phenol or a cresol and acetaldehyde or paraldehyde. For the impregnation the product is in soln. preferably in a mixt. of alc. and benzene. The material is then coated with thin films of the condensation product contg. filling material, heated to set the coatings, then coated more thickly with the product contg. less filling material and finally baked again. The finished material may be used in the production of sound records, printing plates, panels, matrices, etc.

Several layers of fibrous material may be used in the core united by means of the condensation product as adhesive. The preferred proportions are 100 parts of phenol to 75 parts of acetaldehyde with a mineral acid and nigrosine or  $\text{ZnCl}_2$  as catalysts; or 100 parts of phenol and 35 of the aldehyde may be used and after the elimination of the acid catalyst the mass is hardened by the addition of a soln. of  $\text{NaHSO}_4$  in acetaldehyde.

**Moldable composition.** E. E. SCHUMACHER. U. S. 1,422,483, July 11. A mixt. formed from glycerol 4, plaster of Paris 10 and  $\text{H}_2\text{O}$  1.5 parts is used for uniting glass surfaces or making molded articles.

**Plastic compositions.** K. WOLF. Brit. 178,320, April 13, 1921. Natural, dense, or heavy magnesite is heated to  $600\text{--}700^\circ$ , cooled and dry-slaked, re-heated to  $800^\circ$ , and mixed with  $\text{MgCl}_2$  soln. which has been concd. to  $36^\circ \text{Bé.}$  and filtered. Suitable proportions are 40 parts of  $\text{MgO}$  to 60 parts of soln. Colloidal filling materials such as clay or kieselguhr may be added. The compns. are suitable for wall coverings, putty, cements, etc. Cf. C. A. 16, 2766.

**Adhesives; starch.** A. G. BLOXAM. Brit. 177,985, March 23, 1921. An adhesive consists of starch paste contg. a small quantity of soap which is added to the starch before or during its conversion into paste. The soap must be sol. in or emulsifiable with  $\text{H}_2\text{O}$ , such as soap of a resin acid or fatty acid. The soap may be mixed with the starch and passed with  $\text{H}_2\text{O}$  over roller driers. The flakes thus produced are ground and mixed with  $\text{H}_2\text{O}$  to form an adhesive. Another method consists in saponifying fats, oils, waxes, etc., with an alc. soln. of alkali in the presence of starch, or acids may be mixed with the starch and saponified with bases or carbonates. Cf. 4719, 1908.

**Composition for sealing metal containers.** J. H. MACKENZIE. U. S. 1,422,114, July 11. A pasty mixt. of flour, gums,  $\text{H}_2\text{O}$ , glycerol and resin (with sufficient  $\text{MeOH}$  to dissolve the resin) is used for sealing tins or other containers.

**Sealing composition impervious to gasoline.** M. I. STRAUSS. U. S. 1,423,821, July 25. The ppt. formed by the action of  $\text{H}_2\text{SO}_4$  on a  $\text{NaOH}$  soln. of shellac is dissolved in alc. and this soln. is mixed with asbestos fiber or other fibrous material to prep. a compn. impervious to gasoline or oils and adapted for stopping leaks in gasoline conduits or for coating gaskets. Cf. C. A. 15, 3910.

**Rendering kapok and other fibers incombustible.** R. C. VALLS. U. S. 1,422,242, July 11. The fiber is treated with alc. or other solvent of low b. p. and with ammonium phosphate.

**Pressure generation for torpedoes or the like.** A. T. KASLEY. U. S. 1,423,330, July 18. In generation of pressure in mines, torpedoes, submarines or elsewhere where the supply of air is very limited,  $\text{NH}_4\text{NO}_3$  soln. is pumped into a chamber contg. coke and metallic Na to cause initial heating and generate pressure which may be used for driving a turbine in conjunction with a charge of smokeless powder.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

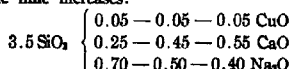
G. E. BARTON, C. H. KERR

**Glasses colored with copper oxide.** ALBERT GRANGER. *Le verre* 2, 73-4(1922).—A blue glass may be obtained from the following:

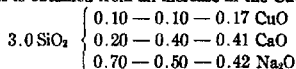
2.5	} $\text{SiO}_2$	0.05 $\text{CuO}$
3.0		0.25 $\text{CaO}$
3.5		0.70 $\text{Na}_2\text{O}$ or $\text{K}_2\text{O}$

Substitution of 0.25  $\text{CaO}$ ,  $\text{BaO}$ ,  $\text{ZnO}$ , or  $\text{PbO}$  in the 3.5  $\text{SiO}_2$  formula does not cause any change in the color. In the 3.0  $\text{SiO}_2$  glass, 0.25  $\text{MgO}$  developed a poor blue. Lowering

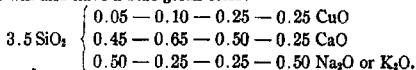
the alkalis and increasing the lime give a blue-green as in 2.5 SiO<sub>2</sub>, 0.05 CuO, 0.45 CaO, and 0.50 Na<sub>2</sub>O or K<sub>2</sub>O. Increase in CuO to 0.10 causes this glass to become green, further additions of CuO causing the glass to darken. In the following a green effect is noticed as the lime increases:



A blue-green glass is obtained from an increase in the CuO:

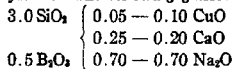


More acid glasses will also have a blue-green color:

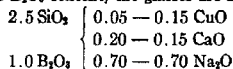


In the glass 3.5 SiO<sub>2</sub>, 0.05 CuO, 0.70 CaO, 0.25 Na<sub>2</sub>O, where the lime is much in excess, the copper is pptd. by touching the hot melt with a cold body. *Effect of alumina.* Addition of 0.1 Al<sub>2</sub>O<sub>3</sub> to 3.5 SiO<sub>2</sub>, 0.05 CuO, 0.25 CaO, 0.70 Na<sub>2</sub>O showed no effect.

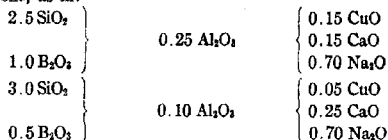
*Effect of boric anhydride.*—The following glasses have a very rich peacock-blue tint:



On increasing the B<sub>2</sub>O<sub>3</sub> content, the glasses are much darkened:



besides the deepened color, these glasses appear green-black by reflection. The simultaneous addition of B<sub>2</sub>O<sub>3</sub> and Al<sub>2</sub>O<sub>3</sub> seems to give more transparency to the glass than with the B<sub>2</sub>O<sub>3</sub> alone, as in:



*Effect of ferric oxide.*—The addition of 0.027 Fe<sub>2</sub>O<sub>3</sub> to 2.5 SiO<sub>2</sub>, 0.11 CuO, 0.36 CaO, 0.53 Na<sub>2</sub>O gave a true green, whereas the base glass did not. LOUIS NAVIAS

*Nature of the coloring properties of selenium red.* A. A. GRANGER. *Trans. Ceram. Soc.* 21, 89-90(1921-22).—A mixt. of S and Se on cooling after gentle heating has a ruby color, and is a solid soln. of Se in S. S and CdS do not give a new coloration. CdS and Se become red on prolonged heating, the Se reacting with the free S contained in the CdS. If the CdS is gently roasted to eliminate the free S the reaction with the Se is very slow. It is concluded that the red coloration is produced by the soln. of Se in S, the CdS acting as a solvent. J. S. C. I.

*Examination of glass by polarized light.* S. NAKAMURA. *J. Soc. Glass Tech.* 5, 57-61(1921).—N. describes a strain tester for optical glass slabs in which a sheet of black glass is used as polarizer, and is so fixed that, with polarizer and analyzer set with crossed planes, the slab is in the "diagonal position" when laid horizontally between. The degree of strain is indicated by the amt. of double refraction at the center of the slab, and this is measured by trial, a series of mica films of known retardation being used to obtain total extinction. J. S. C. I.

**Relative advantages of limestone, burnt lime, and slaked lime as constituents of common glass batches containing soda-ash and saltcake.** F. W. HODKIN AND W. E. S. TURNER. *J. Soc. Glass Tech.* **5**, 188-94(1921).—Very small melts of soft-glass batches, both with and without Mg, were examd. Soda-ash burnt-lime batches in all cases melted the most rapidly and were the most fluid at corresponding temps. Soda ash batches contg. slaked lime melted more rapidly than those contg. limespar. With saltcake as the alkali the burnt lime batch was the slowest melting of all, and the slaked lime batch the most viscous. The batch mixts. soda ash-lime spar, soda ash-salt cake-lime spar, and soda ash-salt cake-lime showed no marked difference in rate of melting. Glasses with soda ash alone as alkali were marked with a slight scum.

J. S. C. I.

**Development of various types of glass. XI. Effect of joint presence of sodium and potassium on solubility of lead glasses.** C. J. PEDDLE. *J. Soc. Glass Tech.* **5**, 195-200 (1921); cf. C. A. **16**, 620.—In the series of glasses alkali-RO-SiO<sub>2</sub>, where RO is either CaO or PbO, and where the total alkali is less than 20%, the glass contg. both K and Na oxides in equal proportion by wt. will be less sol. and more durable than the glasses which contain one of these alkalis only. This is true whatever the percentage of PbO, or of CaO, or of SiO<sub>2</sub>. To obtain max. durability in an alkali PbO-SiO<sub>2</sub> glass the Na and K oxides should be mixed in the ratio of 7 pts. of potash and 3 pts. of soda, a ratio which holds good for all percentages of alkali below 20 and which is independent of the amts. of PbO and of SiO<sub>2</sub>. A lead glass of the following percentage compn. would be the most satisfactory in regard to color, d., brightness, durability, melting, and working, for making high-grade cut-glass ware: SiO<sub>2</sub> 42, PbO 48, Na<sub>2</sub>O 3, K<sub>2</sub>O 7.

J. S. C. I.

**Development of various types of glass. XII. Interaction of silica, sodium oxide, and barium oxide.** C. J. PEDDLE. *J. Soc. Glass Tech.* **5**, 201-11(1921); cf. C. A. **14**, 2536; **15**, 2966; **16**, 620, and preceding abstr.—Two series of melts were made, of the mol. types 100 SiO<sub>2</sub>, 40 Na<sub>2</sub>O,  $x$  BaO, and 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O,  $x$  BaO, where  $x$  varied from 5 to 40. All glasses fluxed and plained well except 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O, 5 BaO, which deposited silica. The color was deeper in the first series and increased with increase of BaO content. Density increased in both series with increase of BaO, while for glasses with less than 16 mols. BaO increase of Na<sub>2</sub>O increased the d. The rate of increase of d. per mol. BaO was greater in the series with lower Na<sub>2</sub>O content, and fell as the BaO increased in amt. Increase of d. per 1% rise of BaO was about 0.019 for the first series and 0.024 for the second. In both series  $\eta_D$  increased with increase of BaO, the mol. rate of increase being greater in the second series. With const. mol. amts. of BaO,  $\eta_D$  increased with increase of Na<sub>2</sub>O content until a BaO content of 26 mols. was reached. The greater the Na<sub>2</sub>O content the smaller was the effect of additional BaO on the value of  $\eta_D$ , and the greater the amt. of BaO the smaller was the effect of added Na<sub>2</sub>O. Although glasses 100 SiO<sub>2</sub>, 40 Na<sub>2</sub>O, 26 BaO and 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O, 26 BaO had the same value of  $\eta_D$  (1.561), the total dispersions differed, being 0.01037 and 0.00992, resp. In both series total dispersion increased with increasing BaO content, while where the mol. amts. of SiO<sub>2</sub> and BaO remained const. increase of Na<sub>2</sub>O increased total dispersion. The rate of increase of total dispersion with increasing mol. content of BaO was slightly greater in the second series. The values of  $\nu$  were greater in the second series, and decreased with increasing BaO content, the rate of decrease being less the greater the amt. of BaO present. Both red and blue ends of the spectrum were lengthened by increase of the no. of BaO mols. present, the lengthening being greater in the second series. Glasses 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O, 30 BaO and 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O, 40 BaO devitrified on slow cooling. Devitrification tests (heating to 900° for 6 hrs. and cooling in 12 hrs.) proved that glasses contg. more than 68% SiO<sub>2</sub> tend to devitrify

and deposit silica; those with more than 17%  $\text{Na}_2\text{O}$  may contain 35%  $\text{BaO}$  without devitrifying, but with a lower  $\text{Na}_2\text{O}$  content 20%  $\text{BaO}$  tends to cause a deposit of  $\text{Ba}$  silicate. The soly. in boiling water fell with increase of  $\text{BaO}$ , and where the  $\text{BaO}$  was const. soly. increased with increase of  $\text{Na}_2\text{O}$ . None of the first series fell within the standard of optical durability, while in the second series 100  $\text{SiO}_2$ , 20  $\text{Na}_2\text{O}$ , 30  $\text{BaO}$ , and 100  $\text{SiO}_2$ , 20  $\text{Na}_2\text{O}$ , 40  $\text{BaO}$  fell in Class III, and 100  $\text{SiO}_2$ , 20  $\text{Na}_2\text{O}$ , 20  $\text{BaO}$  in Class V, but through tendency to devitrification they were useless for optical purposes.

**XIII. Interaction of silica, potassium oxide, and barium oxide.** *Ibid* 212–20.—The 2 series studied were 100  $\text{SiO}_2$ , 40  $\text{K}_2\text{O}$ ,  $x$   $\text{BaO}$  and 100  $\text{SiO}_2$ , 20  $\text{K}_2\text{O}$ ,  $x$   $\text{BaO}$ ,  $x$  varying from 5 to 40. All gave plain glasses without devitrification on cooling, the color increasing with  $\text{BaO}$  content, particularly in the first series. Where the content of  $\text{BaO}$  was less than 16 mols. addn. of  $\text{K}_2\text{O}$  increased the  $d$ , while added  $\text{BaO}$  increased the  $d$  in both series. The rate of increase of  $d$  per mol.  $\text{BaO}$  was greater in the series with lower  $\text{K}_2\text{O}$  content and fell with increasing  $\text{BaO}$ . In both series  $\eta_D$  increased with rising  $\text{BaO}$  content, the rate being greater in the second series. With the same  $\text{BaO}$  content the first series had a higher value of  $\eta_D$  until the  $\text{BaO}$  content reached 28 mols. In both series the greater the  $\text{K}_2\text{O}$  content the less was the effect on  $\eta_D$  of added  $\text{BaO}$ , while the greater the  $\text{BaO}$  content the less the effect of  $\text{K}_2\text{O}$ . Total dispersion increased with increasing  $\text{BaO}$  content, and where  $\text{SiO}_2$  and  $\text{BaO}$  remained const. the glass with more  $\text{K}_2\text{O}$  had a larger total dispersion. The rate of increase of total dispersion with increase of mol.  $\text{BaO}$  content was slightly greater in the second series. Although glasses 100  $\text{SiO}_2$ , 20  $\text{K}_2\text{O}$ , 28  $\text{BaO}$  and 100  $\text{SiO}_2$ , 40  $\text{K}_2\text{O}$ , 28  $\text{BaO}$  had the same value of  $\eta_D$  (1.561) their total dispersions were 0.01007 and 0.01020, resp. The effect of  $\text{BaO}$  on total dispersion decreased much less rapidly than the effect of potash, as the amt. of  $\text{BaO}$  increased. Values of  $\nu$  were greater in the second series; they decreased with an increasing no. of mols. of  $\text{BaO}$  present, and the rate of decrease was less the greater the  $\text{BaO}$  content. Both red and blue ends of the spectrum were lengthened by mol. increase of  $\text{BaO}$  in the glass, increase of  $\text{K}_2\text{O}$  and  $\text{BaO}$  both spreading the blue end more than the red. Devitrification tests showed no sepn. of silica if this was below 70%. With  $\text{K}_2\text{O}$  above 25%, up to 32%  $\text{BaO}$  can be introduced without devitrification, while with the  $\text{K}_2\text{O}$  below 17%, a glass with 25%  $\text{BaO}$  will tend to deposit  $\text{Ba}$  silicate. Durability increased with increase of  $\text{BaO}$ , while if the  $\text{BaO}$  was const. increase of  $\text{K}_2\text{O}$  decreased durability. None of the first series fell within the limits of durability for optical glasses. In the second series, glasses 100  $\text{SiO}_2$ , 20  $\text{K}_2\text{O}$ , 30  $\text{BaO}$  and 100  $\text{SiO}_2$ , 20  $\text{K}_2\text{O}$ , 40  $\text{BaO}$  fell in Class IV, but would be unsuitably since they devitrify on slow cooling.

**XIV. Interaction of silica, barium oxide, and the oxides of sodium and potassium.** *Ibid* 220–8.—The 2 series studied were 100  $\text{SiO}_2$ , 20  $\text{Na}_2\text{O}$ , 20  $\text{K}_2\text{O}$ ,  $x$   $\text{BaO}$  and 100  $\text{SiO}_2$ , 10  $\text{Na}_2\text{O}$ , 10  $\text{K}_2\text{O}$ ,  $x$   $\text{BaO}$ ,  $x$  varying from 5 to 40. No glasses devitrified on cooling. The color increased with increase of  $\text{BaO}$  content. In both series increase of  $\text{BaO}$  increased the  $d$ , while below 28 mols.  $\text{BaO}$ , increase of alkali oxides also increased the  $d$ . The value of  $\eta_D$  in all cases increased with increase of  $\text{BaO}$ , the rate of increase being greater in the second series. The first series has a greater value of  $\eta_D$  up to the point where 27 mols.  $\text{BaO}$  were present. In both series, the greater the amt. of alkali oxide, the less the effect of added  $\text{BaO}$  on the value of  $\eta_D$ , and the greater the amt. of  $\text{BaO}$ , the less was the effect of alkali oxide. Total dispersion increased in each case with rise of  $\text{BaO}$  content, while, where the no. of mols. of  $\text{SiO}_2$  and  $\text{BaO}$  were const., increase of the alkali oxides increased total dispersion. The rate of increase of total dispersion with increase of  $\text{BaO}$  was greater in the second series. Values of  $\nu$  were greater in the second series and decreased in both series with increase of  $\text{BaO}$ . Both red and blue ends of the spectrum were lengthened as the amt. of  $\text{BaO}$  rose, the blue end spreading relatively more than the red. None of the glasses in cooling from  $1350^\circ$  in 12 hrs. showed devitrification. Devitri-

fication tests proved that where the silica is greater than 70%, it tends to sep. on second heating and cooling. With more than 20% of alkali up to 35% of BaO can safely be added, but with less than 15% of alkali Ba silicate tends to sep. out if the BaO content exceeds 20%. Soly., in each series, fell rapidly with increase of BaO content, while if the BaO remained const. the soly. increased with increasing alkali. None of the glasses of the first series had the requisite durability for optical glass, while of the second series 100 SiO<sub>2</sub>, 10 Na<sub>2</sub>O, 10 K<sub>2</sub>O, 40 BaO were in Class III, 100 SiO<sub>2</sub>, 10 Na<sub>2</sub>O, 10 K<sub>2</sub>O, 30 BaO and 100 SiO<sub>2</sub>, 10 Na<sub>2</sub>O, 10 K<sub>2</sub>O, 20 BaO were in Class IV, and 100 SiO<sub>2</sub>, 10 Na<sub>2</sub>O, 10 K<sub>2</sub>O, 15 BaO were in Class V. None of these, however, could be made without devitrification on slow cooling. XV. Comparison of the alkali-barium oxide-silica glasses. *Ibid* 228-56.—A correlation of results from the foregoing 3 papers and from an additional series of melts in which the glasses were built up on a basis of compn. by wt. The densities of glasses of the mol. series 100 SiO<sub>2</sub>, 40 Na<sub>2</sub>O,  $x$  BaO and 100 SiO<sub>2</sub>, 20 Na<sub>2</sub>O,  $x$  BaO were greater than those of the corresponding potash glasses, when  $x$  was more than 7 mols. The mixed alkali glasses gave values intermediate between those for potash alone and those for soda alone. Where percentage by wt. was considered, glasses contg. only Na<sub>2</sub>O as alkali had a greater d. than those contg. the same amt. of K<sub>2</sub>O as alkali, while glasses in which K<sub>2</sub>O and Na<sub>2</sub>O occurred in equal amts. gave intermediate values. The following const. for d. increase were found: with SiO<sub>2</sub> const., 1% of Na<sub>2</sub>O replaced by 1% of BaO 0.015, 1% of K<sub>2</sub>O by 1% of BaO 0.014, with Na<sub>2</sub>O const., 1% of SiO<sub>2</sub> by 1% of BaO 0.023, with K<sub>2</sub>O const., 1% of SiO<sub>2</sub> by 1% of BaO 0.023. The soda glasses of both mol. series had a higher value of  $\eta_D$  when the BaO content was less than 11 mols.; above this, potash glasses had the greater value. The total dispersion of the series with 40 Na<sub>2</sub>O was greater than that of the series with 40 K<sub>2</sub>O, while the reverse held for the series with 20 Na<sub>2</sub>O and 20 K<sub>2</sub>O. Values of  $\eta_D$  and total dispersion for series with 20 K<sub>2</sub>O, 20 Na<sub>2</sub>O and 10 K<sub>2</sub>O, 10 Na<sub>2</sub>O were intermediate between those of the corresponding soda and potash series. In glasses contg. the same wt. of Na<sub>2</sub>O or K<sub>2</sub>O, the soda glasses had a higher value of  $\eta_D$  and total dispersion than the potash glasses. Replacement of 1% of Na<sub>2</sub>O by 1% of BaO (SiO<sub>2</sub> const.) increased  $\eta_D$  by 0.0011 and decreased ( $\eta_F - \eta_C$ ) by 0.00002; of 1% of K<sub>2</sub>O by 1% of BaO (SiO<sub>2</sub> const.) raised  $\eta_D$  by 0.0010 and lowered ( $\eta_F - \eta_C$ ) by 0.00002; of 1% of SiO<sub>2</sub> by 1% of BaO (Na<sub>2</sub>O const.) increased  $\eta_D$  by 0.0023 and ( $\eta_F - \eta_C$ ) by 0.00006; of 1% of SiO<sub>2</sub> by 1% of BaO (K<sub>2</sub>O const.) increased  $\eta_D$  by 0.0024 and ( $\eta_F - \eta_C$ ) by 0.00007. Soda was a better flux than potash, where the amt. present by wt. was the same. In corresponding soda and potash glasses the one contg. soda had the lower m. p. Devitrification with pptn. of silica more readily occurred in soda glasses but, in glasses with high BaO content, pptn. of Ba silicate took place sooner in potash glasses. In glasses with less than 20% of alkali, those with equal amts. of Na<sub>2</sub>O and K<sub>2</sub>O were less sol. than those with a single alkali, the mixed alkali type being more durable. With more than 25% of BaO they became iridescent on exposure, if contg. more than 25% of alkali, but with only 10% of alkali no iridescence appeared until the BaO reached 40%. Glasses in the region of the following percentage compns. by wt. were capable of ordinary use: Class III, 80 SiO<sub>2</sub>, 10 K<sub>2</sub>O, 30 BaO. Class V, 60 SiO<sub>2</sub>, 15 K<sub>2</sub>O, 25 BaO; 65 SiO<sub>2</sub>, 7.5 Na<sub>2</sub>O, 7.5 K<sub>2</sub>O, 20 BaO; 65 SiO<sub>2</sub>, 15 K<sub>2</sub>O, 20 BaO; 70 SiO<sub>2</sub>, 7.5 Na<sub>2</sub>O, 7.5 K<sub>2</sub>O, 15 BaO. The second and third only were suitable for optical work, the other devitrifying on heating. All these glasses had a greater tendency to devitrification than the corresponding lime glasses and were much worse in weathering properties, factors outweighing increase of brilliance and d. in replacing CaO by BaO in Hard Crown glass. To obtain durable Ba glasses other oxides must be introduced, such as ZnO, Al<sub>2</sub>O<sub>3</sub>, PbO, and B<sub>2</sub>O<sub>3</sub>. XVI. Comparison of the alkali-barium silicate and alkali-lead silicate glasses. *Ibid* 256-68.—In the mol. series 100 SiO<sub>2</sub>, 40 R<sub>2</sub>O,  $x$  BaO, 100 SiO<sub>2</sub>, 40 R<sub>2</sub>O,  $x$  PbO, 100 SiO<sub>2</sub>, 20 R<sub>2</sub>O,

$x$  BaO and 100 SiO<sub>2</sub>, 20 R<sub>2</sub>O,  $x$  PbO, where R<sub>2</sub>O represents either Na<sub>2</sub>O or K<sub>2</sub>O or a mixt. of these, and  $x$  varies from 5 to 40, the replacement of 1 mol. BaO by 1 mol. PbO gave a large increase of  $d$ . in all cases. The mol. rate of increase of  $d$ . with RO increase was greater for PbO than BaO. The replacement of BaO by PbO, wt. for wt., gave an increase of  $d$ . whatever the alkali, if the PbO or BaO was over 5%. In glasses contg. less than 65% SiO<sub>2</sub> and less than 25% alkali, the rise in  $d$ . per 1% replacement of BaO by PbO was about 0.003 (only cases where all the BaO was replaced were studied). Where the percentage of SiO<sub>2</sub> was const., replacement of alkali by PbO raised the  $d$ . more than its replacement by BaO. With const. amt. of alkali the rise of  $d$ ., due to replacement of SiO<sub>2</sub> by PbO, was greater than that for replacement of SiO<sub>2</sub> by BaO. In all series of both PbO and BaO glasses replacement of 1% of SiO<sub>2</sub> by 1% of alkali increased the  $d$ . by 0.008. In the mol. series, replacement of BaO by PbO, mol. for mol., largely increased both  $\eta_D$  and total dispersion. Increase of PbO in a glass had a much greater effect in increasing  $\eta_D$  and total dispersion than increase of BaO. In all cases examd. (i. e., SiO<sub>2</sub> 50–70, R<sub>2</sub>O 10–25, RO 5–40%) the lead glasses had a higher value of  $\eta_D$  and a lower  $\nu$  than glasses contg. an equal wt. of BaO, while lead glasses contg. soda had a greater total dispersion than Ba soda glasses when the RO was greater than 4%, and lead-potash than Ba-potash when RO exceeded 8%. Where SiO<sub>2</sub> was const. and RO replaced alkali by wt.,  $\eta_D$  increased at the same rate for both lead and Ba glasses, the total dispersion increased for lead but decreased for Ba glasses, while  $\nu$  decreased for lead and increased for Ba glasses. Where alkali was const. and SiO<sub>2</sub> was replaced by RO,  $\eta_D$  and total dispersion increased more rapidly in the lead series, while  $\nu$  fell more rapidly with the same glasses. Where alkali replaced SiO<sub>2</sub> (RO const.)  $\eta_D$  and total dispersion increased more rapidly for lead glasses. Lead glasses spread the spectrum towards the blue end more than Ba glasses. In both equimol. and equiv. wt. series lead glasses were the less sol. Two types of weathering were noticeable for both lead and Ba glasses, one when the alkali content was large, and filming occurred through atm. attack, another in which iridescence was produced, owing to high PbO or BaO content (alkali often being small). A study of the action of various gases proved the iridescence in lead glasses to be chiefly due to the action of H<sub>2</sub>S(CO<sub>2</sub>, SO<sub>2</sub>, and acid vapor also contributing), while in Ba glasses acid vapors were chiefly responsible. In both cases org. impurity, as grease, increased the iridescence. J. S. C. I.

**Thermal expansion of glasses containing aluminium.** S. ENGLISH AND W. E. S. TURNER. *J. Soc. Glass Tech.* 5, 183–7 (1921).—In the series of Na-Al trisilicate glasses the substitution of Al<sub>2</sub>O<sub>3</sub> for Na oxide was found to reduce the coeff. of thermal expansion much more than replacement of the soda by either lime or magnesia, while the mol. substitution of Al<sub>2</sub>O<sub>3</sub> for lime in Na-Ca-Al trisilicate glass appreciably lowered the thermal expansion. No factor could be given from the results for the effect of Al<sub>2</sub>O<sub>3</sub>. J. S. C. I.

**Some properties of the lime-magnesia glasses and their applications.** I. V. DUMBLEBY, F. W. HODKIN AND W. E. S. TURNER. *J. Soc. Glass Tech.* 5, 352–7 (1922).—Following the expts. of Davidson, Hodkin and Turner (*C. A.* 14, 1880) which showed that the replacement of small proportions of Na oxide by magnesia increased the rate of melting, tests were made on a lime-soda glass of mol. compn., 8 SiO<sub>2</sub>.0.8 CaO.1.2 Na<sub>2</sub>O. The lime was successively replaced by magnesia, and the rate of melting, "fining," working and general properties were found to improve up to the mol. ratio CaO : MgO = 5 : 3. When the ratio was 1 : 1 or more, the glass was less easy to work than the plain lime-soda glass. The lamp-working properties and resistance of devitrification were improved throughout the series by the addn. of magnesia. II. S. ENGLISH AND W. E. S. TURNER. *Ibid* 357–63.—The annealing temps. of the glasses described were detd.; those for the mixed glasses were distinctly below those for the simple lime-



soda or lime-magnesia ones. The results suggested that the glasses with mixed bases were softer than those contg. either base alone. The coeffs. of expansion showed an almost continuous reduction from the lime-soda to the lime-magnesia glasses.

J. S. C. I.

**Disintegration of soda-lime glasses in water.** A. E. WILLIAMS. *J. Am. Ceram. Soc.* 5, 504-17(1922); 10 photos.—Tumblers, milk bottles, battery jars, etc., were tested in  $H_2O$  at temps. below the b. p., at the b. p., and up to 25 lbs. pressure in an autoclave. Treatment at b. p. for 6 hrs. or more will indicate the resistance to attack by  $H_2O$ , also the general mech. strength. Both compn. and mech. condition of the surface are important. The inside and outside surfaces of blown ware behave differently. In glasses of resistant compn., reheating the surface will prevent spalling. Glasses of poor resistance, however, are not helped by reheating.

C. H. KERR

**Suggested method for determining absolute viscosity of molten glass.** I. MASSON, L. F. GILBERT AND H. BUCKLEY. *J. Soc. Glass Tech.* 5, 337-41(1922).—The method is an application of Ladenburg's correction of Stoke's law to the measured rate of fall of a metal sphere through a liquid, and had been previously successfully applied to thick collodion solns. (*C. A.* 14, 2431). Other conditions being kept const., the formula reduced to  $\eta = (D - d)T \times \text{const.}$ , where  $\eta$  is coeff. of viscosity,  $D$  the density of sphere,  $d$  that of liquid, and  $T$  the time of fall through a given distance, the const. being fixed for the app. A shadow of the steel ball sinking through the liquid was projected by X-rays on a sensitive plate to cause the ball to plot its own rate of fall. The  $d$  of the liquid could be found by employing balls of different densities. Trials were made on artificial sirupy mixts. and close agreement found between values obtained in this way and those from visual measurement. It was considered that a more powerful X-ray tube, e. g., of the Coolidge type, would be necessary to yield rays capable of penetrating the furnace walls in an actual detn. on glass.

J. S. C. I.

**Density of glasses containing aluminium.** S. ENGLISH AND W. E. S. TURNER. *J. Soc. Glass Tech.* 5, 277-80(1921).—A series of glasses varying from 2  $Na_2O$ , 6  $SiO_2$  to 1.4  $Na_2O$ , 0.6  $Al_2O_3$ , 6  $SiO_2$  and a series of 3 glasses contg. Al and Ca were examd. Carefully annealed grains of 10- to 30-mesh were used, the immersion fluid for the first series being toluene, and for the second, water. Mol. substitution of  $Al_2O_3$  for  $Na_2O$  caused considerable decrease in  $d$ , soda-alumina glasses being lighter than corresponding soda-magnesia glasses. Wt. for wt., alumina decreased the  $d$ . less than magnesia. The results do not substantiate the  $d$ . factors suggested by Baillie (*C. A.* 15, 3374), who gave as the effect of 1%  $Al_2O_3$  a value 2.75, and for 1%  $MgO$  3.25, according to which, when equal wts. are present, magnesia glasses should have a greater  $d$ .

J. S. C. I.

**Re-annealing of glass.** W. A. WHATMOUGH. *J. Soc. Glass Tech.* 5, 44-54(1921).—The annealing of a glass prevents the development of strain only, but re-annealing, by heating glass to its softening point, releases strains already present. High ring strain is produced in articles such as specimen tubes made from glass tubing by machines with high velocity burners, and to remove this W. constructed a re-annealing oven which is very successful. In its present form it consists of a tunnel lehr, 9 in. sq., shaped like an inverted siphon, the mouth of the short entrance limb being at a lower level than that of the longer exit limb. The central horizontal portion is a fireclay muffle, heated by two rows of burners which can be accurately adjusted. The bottom of the tunnel, on which an endless chain tray track runs, is of cast iron, and the lagging is of slag wool between metal plates. In both limbs are draw-off valves for hot gas, and nine pyrometers are inserted. The track can be drawn through at varying rates. To prevent the cracking of long tubes by "steaming" an oven is constructed over the hot end of the long limb to give articles a preliminary warming. W. follows the conditions of the critical annealing curve as worked out by English and Turner (*C. A.* 12, 2240).

J. S. C. I.

**Measurement of small variations of refractive index throughout meltings of optical glass.** A. J. DALLADAY AND F. TWYMAN. *J. Soc. Glass Tech.* 5, 325-30(1922).—The instrument used was a modified Michelson refractometer described by Twyman (*Phil. Mag.* 35, 49(1918)) in which two images of the source of light were visible through the eyepiece. Since with monochromatic light all the bands appeared alike and the use of the instrument depended on the recognition of a particular band wherever it appeared, white light was used as a source, enabling the white central band to be distinguished. A composite block was prepd. from samples of different portions of the melt by grinding and subsequent heat treatment and a test-piece cut from this compared with a homogeneous one from a single portion. Inhomogeneity in the composite block was readily detected by a shifting of the bands, and by superimposing a light of definite wave length  $\gamma$  on the white light, the actual variation of  $n \Delta\mu$  between the portions was obtained from the formula  $n = (2t \Delta\mu)/\lambda$ ,  $t$  being the thickness of each of the two test-pieces and  $n$  the number of band shifts produced. A variation of 0.000001 in  $\mu$  brought about a shift of 0.1 band for  $\lambda = 5461$  A. U. J. S. C. I.

**Clouding of table-working glass tubing in the blowpipe flame.** M. W. TRAVERS. *J. Soc. Glass Tech.* 5, 61-70(1921).—In articles made in the blowpipe flame from glass tubing a faint opalescent ring occasionally appears immediately adjacent to the glass actually melted. The effect was only obtained with coal gas when O was in excess, and in the oxy-hydrogen flame when S compds. were introduced. The amt. of clouding varies with the time of heating. A glass jet heated externally by a H flame and conveying a current of  $\text{SO}_2$  clouded internally on cooling. From Nernst's equation T. calcs. the dissoc. pressure, in atms., of the gases  $\text{CO}_2$ ,  $\text{SO}_2$ , and  $\text{SO}_3$  in contact with the solid phases  $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_4$ , and  $\text{Na}_2\text{SO}_3$  to be  $P_{\text{SO}_2} = 40$ ,  $P_{\text{SO}_2} = 3.0$ ,  $P_{\text{SO}_3} = 10^{-3}$  at  $700^\circ$ , and with the liquid phase, glass, present the values will be raised somewhat. Hence  $\text{CO}_2$  will not attack glass, and  $\text{SO}_2$  at 1 atm. pressure will only attack at a temp. some distance below the softening point. As, however, the  $\text{SO}_3$  content of the burned gases at the edge of the flame varies from  $2 \times 10^{-3}$  atm. upwards, if at  $700^\circ$  only 0.01% of this were converted into  $\text{SO}_2$ , the pressure of the latter would be  $2 \times 10^{-3}$ . Thus it appears probable that there is, within the variation of the limits of the S content of town gas, an amt. which, if exceeded, would cause sufficient pressure of  $\text{SO}_3$  at the edge of the flame to give solid Na sulfate (or less probably silica). J. S. C. I.

**Heat balance of a plant consisting of an air-steam blown gas producer and a glass tank furnace.** M. W. TRAVERS. *J. Soc. Glass Tech.* 5, 166-83(1921).—A detailed analysis of the combustion and melting processes, with consideration of heat losses, gave the following data: In a tank working at  $1400^\circ$ , with regenerators for preheating gas and air to  $600^\circ$ , there would be a fuel efficiency of 35% (the remaining 65% being lost outside the furnace), while, of this energy, 26% would be lost through the furnace walls, and 9% only would be used in melting glass. The coal consumption per ton of glass would be 0.94 ton. In a similar tank where gas and air were preheated to  $800^\circ$  the fuel efficiency would be 45%, of which 12% would be used for melting glass, and 0.73 ton of coal would be used per ton of glass. Finally with air and gas preheated to  $1000^\circ$  the fuel efficiency would be 55% (14.5% used for melting glass), the coal consumption per ton of glass being 0.60 ton. J. S. C. I.

**The evolution and development of glass house equipment.** J. S. HERZOG. *J. Am. Ceram. Soc.* 5, *The Bulletin* 1, 124-31(1922).—Historical. Recent developments and present needs are well discussed. C. H. KERR

**Protective spectacles for ultra-violet rays.** T. INAGAKI. *Rept. Lab. Asahi Glass Co.* 1921.—Spectrographic studies on many glasses have been conducted to find suitable glasses for use as protective spectacles in glass works. A quartz spectrographic app. was used, with C and iron rods as light sources. Noviweld glass is suitable for observ-

ing the fused mass in the glass pot, Crookes' glass B shade (Wellsworth Crookes' Neutral tint, Absorption B) for the front part of the furnace, and Crookes' glass A shade (*Ibid* Absorption A) for glass blowers. (Cf. Crookes, *C. A.* 8, 2609). J. S. C. I.

Colloquium on feldspar and feldspar grinding. *J. Am. Ceram. Soc.* 5, *The Bulletin* 1, 138-46(1922). C. H. KERR

Soluble salts and clay wares. C. W. PARMETER. Univ. of Ill. *J. Am. Ceram. Soc.* 5, 538-53(1922).—The term "efflorescence" should be restricted to surface deposits due to sol. salts in the clays or burned wares and "scum" be used to describe surface deposits formed by the action of furnace gases upon the wares during drying or burning. A surface coating which forms soon after the kiln is opened or within a few days may be permanently removed by  $H_2O$ . Such a residue was found to be  $Na_2SO_4$  and  $NaCl$ , due to  $NaCl$  in the fuel and its subsequent change, in part, to  $Na_2SO_4$ , caused by the action of oxides of S evolved from the fuel. A good review article. C. H. K.

Dehydration of dried clays. J. W. MELLOR, N. SINCLAIR AND P. S. DEVEREUX. *Trans. Ceram. Soc.* 21, 104-6(1921-22).—Finely powdered samples of clay were dried over 25%  $H_2SO_4$  and placed in desiccators contg.  $H_2SO_4$  of different concns. up to 90%. The desiccators were kept in a bath at 25°, and the samples weighed every week. All showed a loss of wt. which was less for china clay than for the other clays examd. No drastic change occurred in the clay mols., as the  $H_2O$  was gradually restored on exposure to a moist atm. The re-absorption of  $H_2O$  is so very slow that a long time is required to restore the original plasticity and working qualities, and certain troublesome clays can, therefore, be mollified by desiccation. J. S. C. I.

Attack of clay substance by lime. E. SELCH. *Sprechsaal* 55, 1-3(1922).—The higher the proportion of  $CaO$  in a ceramic mixt. and the higher the temp. to which it is heated, the greater will be the proportion of sol.  $SiO_2$ ,  $Al_2O_3$ , and  $CaO$  in the burned product. In calcined mixts., even when the temp. has reached cone 12 (1350°), the  $CaO$  is almost completely sol. in  $HCl$ . A measure of the action of  $CaO$  on clay substance is obtained by dividing the proportion of sol.  $SiO_2$  or  $Al_2O_3$  by that of sol.  $CaO$ . The resistance of the burned ware to  $AcOH$  increases with an increase in the firing temp. The proportion of  $Al_2O_3$  sol. in  $AcOH$  decreases as the soly. of the  $CaO$  increases. J. S. C. I.

Dinas bricks of constant volume. O. REBUFFAT. *Trans. Ceram. Soc.* 21, 66-8 (1921-22).—An Italian quartzite which inverted easily into the forms of  $SiO_2$  of lower d. contained 0.81% of  $P_2O_5$ . When the  $P_2O_5$  was removed with  $HNO_3$  the purified quartzite lost the power of inverting rapidly into tridymite. The addn. of 0.45% of  $P_2O_5$  to a primary quartzite which ordinarily was transformed very slowly into tridymite or cristobalite produced almost complete transformation into tridymite on heating for 8 hrs. at 1300-50°. J. S. C. I.

Modern developments in German fine ceramic products, particularly in the manufacture of porcelain and talence. W. FUNK. *Z. angew. Chem.* 35, 81-3(1922).—A review and history with an outline of important problems to be solved, including the development of better fuels, better burning methods, the finding and using of new sources of feldspathic materials, the adaptation of German kaolins, the development of lower temp. hard porcelains which can be more economically produced, etc. C. H. KERR

Porosity. VII. The determination of the porosity of highly vitrified bodies. EDW. W. WASHBURN AND E. N. BUNTING. *J. Am. Ceram. Soc.* 5, 527-37(1922); cf. *C. A.* 16, 1169.—The accuracy limitations of the general lab. research type of *porosimeter* are discussed. A new McLeod-Gage type is described and illustrated. By its use the pore vol. of any test piece can be directly detd. within 0.01-0.02 cc. Tests of 8 pieces of *elec. porcelain* indicated a porosity of  $0 \pm 0.01\%$ . This was confirmed by

dye penetration tests. A simple and rapid app. for measuring the porosity of full size brick is figured and described.

C. H. KERR

**Manganese for improving quality.** ANON. *Brick Clay Record* 61, 32-3(1922).—

By the use of Mn better color and decorative effects can often be produced in brick.

H. G. SCHURCHT

**Theory of plasticity and possible commercial application.** R. C. PURDY. *J. Am. Ceram. Soc.* 5, *The Bulletin* 1, 147-52(1922).—A review of various colloid hypotheses in connection with plasticity. The terms (1) deflocculated for sol. (2) flocculated for gel, (3) clay suspension for colloidal soln., and (4) deflocculated for dispersed are proposed. "Plasticity is the result of purely phys. conditions and properties—adsorption, soln., mol. attraction and high surface tension."

C. H. KERR

**Note on the relation of the structure of clay grains to the plasticity of clays.** H. G. SCHURCHT. *J. Am. Ceram. Soc.* 5, *The Bulletin* 1, 153-5(1922).—The fineness of grain of the particles in the loosely cemented aggregates is an important, but not the only factor.

C. H. KERR

**Mechanism of plasticity from colloid standpoint.** G. A. BOLE. *J. Am. Ceram. Soc.* 5, 469-77(1922).—Plasticity is due to a colloidal film enveloping clay grains, the film and grain being opposite in polarity. Addn. of an electrolyte, acting as a deflocculant, causes the outer layer of the film to be attracted to ions of the same polarity as the clay particles, thus reducing the effective diameter and increasing the polarity of the plasticity-inducing particles. A flocculating ion has the opposite effect. Transport numbers as well as polarity are governing factors. No present method of measuring plasticity is found satisfactory. Standard definitions and standardized units are badly needed. In discussion, Purdy questioned both the assumptions regarding colloids and the conclusions.

C. H. KERR

**Notes on shivering of terra cotta.** J. L. CARRUTHERS. *J. Am. Ceram. Soc.* 5, 518-26(1922).—Six terra cotta clays were tested for shivering as a body trouble, a white mat glaze at cone 2-3 being used. One non-shivering and one badly shivering clay were used to expt. in causing and overcoming shivering. The causes of shivering are (1) finely divided  $\text{SiO}_2$  in the body, from (a) high  $\text{SiO}_2$  clays or (b) finely ground siliceous grog, (2) sol. salts in the clay, grog or tempering  $\text{H}_2\text{O}$  and (3) too long a firing period. To overcome shivering (1) use a flux such as feldspar, feldite or similar rock to overcome the action of fine  $\text{SiO}_2$ , (2) use coarse grog or sand, (3) use  $\text{BaCO}_3$  to overcome the effect of the sol. salts.

C. H. KERR

**Some properties of zinc oxide bodies.** E. E. LIBMAN. *J. Am. Ceram. Soc.* 5, 488-91(1922).—The data were obtained in connection with a study of the phase rule diagram for the system  $\text{ZnO}-\text{Al}_2\text{O}_3-\text{SiO}_2$ . The m. p. of  $\text{ZnO}$  is above  $1800^\circ$  and may be above its normal sublimation point. A very hard, dense body can be prepd. from pure  $\text{ZnO}$ . Its shrinkage increases with increasing temp. but porosity is a min. at about  $1300-1400^\circ$  beyond which temp. it increases. Possibly  $\text{ZnO}$  may be used to advantage in Zn retort bodies.

C. H. KERR

**The control of glaze-fit by means of tensile test specimens.** F. H. RIDDLE AND J. S. LAIRD. *J. Am. Ceram. Soc.* 5, 500-3(1922).—Tests showed that a glaze of good fit greatly increased the tensile strength of the unglazed porcelain while a poorly fitting glaze decreased the strength. One body whose tensile strength, unglazed, was 8,900 lbs. per sq. in. showed an increase to over 10,000 lbs. due to a good glaze and a decrease to under 4,000 lbs. due to a glaze that crazed.

C. H. KERR

**Cold production of water-resistant material.** ANON. *Keram. Rundschau* 30, 280(1922).—The compn. is: 375 flint, 51 limestone, 8 calcined clay, 3 calcined feldspar and 28 parts water glass. The first 4 ingredients are mixed dry and the water glass is added after which it is immediately pressed and dried.

H. G. S.

**Kiln manipulation in relation to school and studio pottery.** F. H. RHEAD. *J. Am. Ceram. Soc.* 5, *The Bulletin* 1, 131-3(1922).—A chart for recording time, temp. and amt. of fuel is reproduced. C. H. KERR

**The Harrop tunnel kiln.** W. E. CRAMER. *J. Am. Ceram. Soc.* 5, 492-9(1922).—A Harrop kiln in use at the General Porcelain Co., Parkersburg, W. Va. is described and pictured. It is 321 ft. long, 54½ in. wide inside and has a placing height of 60 in. Total firing time is 48 hrs. Firing temp. is cone 10, 11 or 12, depending upon the ware. The fuel is natural gas, with an auxiliary fuel oil equipment. C. H. KERR

**Measuring kiln gases.** ANON. *Brick Pottery Trade J.* 30, 132(1922).—Approximate results may be obtained by inserting in the chimney a damper having a sharp orifice at its center, and calcg. the amt. of gas. H. G. SCHURBCHT

**Manufacture of sewer pipe.** ANON. *Keram. Rundschau* 30, 301(1922).—The firing is most economical in coupled kilns, wherein the hot gases pass through at least 3 kilns and the heat from the cooling kilns is utilized in the heating of the newly set ware. About 50% of the fuel is saved. H. G. SCHURBCHT

**Artificial teeth.** ANON. *Keram. Rundschau* 30, 280(1922).—The bodies are rich in feldspar and are fired to cones 5-7.  $TiO_2$  and  $Fe_2O_3$  are added for color. H. G. S.

**Spit-out of glazes on passing through an enamel kiln.** J. MILES. *Trans. Ceram. Soc.* 21, 208-26(1921-2).—Spit-out is considered as due to the expansion of superheated steam generated in the pores of the body. The defect may be minimized by thorough sponging of the clay and allowing the ware to cool slowly from 900° to 800° after firing in the glost oven. The goods while in the glost state must be kept free from contact with moisture, and great care should be taken when sponging off prints, etc. The temp. of the glost oven should rise quickly from 800° to 900°, so as to burst the glaze bubbles, and then much more slowly to the finishing temp. to avoid crooked and blistered ware. In the discussion B. Moore stated that if C occurred in the body and the atm. of the kiln did not become oxidizing until a high temp. was reached "spit out" would be caused. J. S. C. I.

**The influence of fuels containing sulfur on lead glazes.** ANON. *Keram. Rundschau* 30, 280(1922).—Sulfurous gases affect the glazes only when the fumes come in contact with the ware. Firing with a reducing atm. after the glaze has commenced to melt will prevent dull glazes. H. G. SCHURBCHT

**Black porcelain glazes.** ANON. *Keram. Rundschau* 30, 280(1922).—Two kg. of coloring oxide are used to 50 kg. of glaze. The following coloring oxides are usually employed:  $U_3O_8$ ,  $CoO$  and  $Mn_2O_3$ . H. G. S.

**Need for more refractory heat insulators.** R. D. PIKE. *J. Am. Ceram. Soc.* 5, 554-63(1922).—A plea for better high temp. insulators. C. H. KERR

**A new type of gas-fired vitreous enameling furnace.** H. H. CLARK. *J. Am. Ceram. Soc.* 5, 478-87(1922).—A commercially successful furnace is described and illustrated. The working chamber is 4 ft. wide, 3 ft. high and 10 ft. long and is heated by 5 gas burners on each side. It is heated to working temp. (about 1700° F.) in less than 1 hr. and turns out 12 to 24 loads per hr. depending upon the kind of ware. Av. gas used is 1800 cu. ft. of 500 B.t.u. gas per hr. It is low in first cost and in operation. C. H. KERR

**Adressbuch der Keram-Industrie.** 14th Ed. Coburg: Müller & Schmidt. M 150. Reviewed in *Tonina-Ztg.* 46, 674(1922).

**Ceramic compositions.** I. A. CORDENOT. *Brit.* 177,160, March 14, 1922. Grains of natural or artificial corundum, or composite artificial aluminates melted in the elec.

furnace, are incorporated in ceramic compns., particularly those used in the manuf. of elec. app. such as insulators, spark plugs, pulleys, switchboard plates, tubes, boxes, and resistances.

**Porcelain.** F. H. RIDDLE. Brit. 177,553, Sept. 23, 1920. Clay is mixed with an alk. flux and sillimanite or materials adapted to interact to form sillimanite and the mixt. is fired so as to produce sillimanite and a glassy matrix in which practically all the free silica is dissolved. The clay may be kaolin with or without an admixt. of ball clay. The flux may be previously prepd. by firing a mixt. of alk.-earth oxides, introduced as talc, magnesite, whiting, dolomite or the like, and clay, with or without flint. Alternatively these ingredients may be mixed with kaolin and alumina, which react to produce sillimanite, and the operation carried out in one stage. Final product preferably contains 60-85% of sillimanite and 1.5-3.0% of alk. earths. Examples of proportions are given.

**Refractory material for zinc retorts.** W. F. ROSSMAN. U. S. 1,424,120, July 25. A refractory material for manuf. of retorts is formed of plastic clay, finely pulverized  $\text{SiO}_2$  and ground grog about equal in amt. to the  $\text{SiO}_2$ .

**Gas-fired pottery kiln.** A. M. DUCKHAM. U. S. 1,423,408, July 18.

**Prevention of efflorescence on bricks, etc.** E. C. DE MEJER. Brit. 177,990, March 31, 1921. A compn. applied with a brush to brick, mortar, and plaster walls to prevent efflorescence consists of a mixt. of 1 cwt. of Burgundy pitch and 9 gal. of turpentine contg. in soln: 36 oz. beeswax or other wax. Half of the turpentine is added to the melted pitch at a temp. of 290-300° F., and the remainder after cooling to 100° F., or lower.

## 20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

**Relation between the fineness and compactness of cements.** H. NIETZSCHE. *Zement* 10, 663-4(1921); *Chimie et industrie* 7, 1150(1922).—Tests were carried out with very finely and with coarsely ground portland cements, with finely, with coarsely, and with very finely ground slag cements, and with a normally ground iron portland cement. One hundred parts of ordinary sand, 11 parts of sand with particles as fine as 0.2 mm., and 37 parts of cement were used, with enough water to give a mass of the usual consistency. They were made into Bauschinger prisms and were kept 2 days in the molds, 7 days in water, 10 days exposed to the atm., and dried to const. wt. at 50°. They were then measured. As all the mortars had, as nearly as possible, the same cement content, the degree of impermeability could be obtained from the vol. of the pores. The tests showed that the finer the degree of grinding, the greater the impermeability.

A. P.-C.

**Constitution and hydration of portland cement.** A. A. KLEIN. *Zement* 10, 636-8(1921); *Chimie et industrie* 7, 1150(1922).—A review of Richardson's theory of the constitution of cement, and of Vicat's, LeChatelier's, Richardson's and the U. S. Bur. of Standards' theories of hydration.

A. P.-C.

**The use of slag cement in construction work.** KROPP. *Zement* 10, 651-2(1921); *Chimie et industrie* 7, 1150(1922).—Certain brands of slag cements are more sensitive to a strong premature desiccation than portland cement; but in the presence of brine slag cement hardens more readily than many portland cements. When properly sprinkled, it is suitable for elevated structures. Owing to the fineness of grinding, large quantities of sand can be added, and the resulting mortars are still relatively strong. Owing to its low CaO content, it is stronger than many portlands. K. gives the compns. and methods of prepn. used in mining work, more particularly for filling up fissures in rock by injection.

A. P.-C.

**Durability of cement drain tile and concrete in alkali soils: Third progress report (1919-20).** G. M. WILLIAMS. Bur. Standards, *Tech. Paper* No. 214 (1921).—Tentative conclusions regarding cement drain tile: (1) The use of cement drain tile in soils high in sulphates is hazardous. The best quality disintegrated within six yrs. (2) Disintegration is due primarily to chem. attack. (3) The disintegrating effect seems to vary with the concn. (4) Tile mixed comparatively dry are less resistant to alk. action than tile of a wetter consistency. (5) Tile cured with steam are no better than those cured by systematic sprinkling. Tar and cement grout coatings are not effective protectors. Regarding concrete the tentative conclusions are: (1) Surface action after 1 year's exposure has in most cases been progressive. (2) The extent and rate of disintegration depends upon concn. of soluble sulphates. (3) Disintegration blocks contg. reinforcing rods has, in some cases, been aided by corrosion of the rods. (4) Concrete of the best quality will disintegrate if exposed to sufficiently high concns. of alkali. (5) The resistance varies with the richness of mix, indicating that strength and permeability, rather than absorption, are the governing factors. H. F. STALEY

**Tests on mortars and concrete immersed in sea water for fifteen years.** E. CANDLIOT. *Rev. mat. constr. trav. pub.* 153, 105-6 (1922).—Results of tests made at Haiphong, Indo-China. Large blocks were cemented onto the rocks, where they were covered at high tide and exposed at low tide. Cement No. 1. (used for sea work) had the following properties:  $\text{SiO}_2$  22.20,  $\text{Al}_2\text{O}_3$  6.85,  $\text{Fe}_2\text{O}_3$  2.00,  $\text{CaO}$  66.05,  $\text{MgO}$  0.25,  $\text{SO}_3$  0.50, ignition loss 2.15%, apparent d. 1.228, time of set 4 hrs., tensile strength of pure cement, after 7 days 34.0, 28 days 45.0,  $2\frac{1}{2}$  yrs. 57.7; of 1 : 3 plastic mortar, after 7 days 12.0, 28 days 15.0,  $2\frac{1}{2}$  yrs. 34.0 kg. sq. cm. Cement No. 3 (not intended for sea work):  $\text{SiO}_2$  21.65,  $\text{Al}_2\text{O}_3$  6.90,  $\text{Fe}_2\text{O}_3$  1.95,  $\text{CaO}$  64.75,  $\text{MgO}$  0.30,  $\text{SO}_3$  0.60, ignition loss 3.85%, apparent d. 1.182, time of set 3 hrs. 10 min., tensile strength, of pure cement, after 7 days 37.9, 28 days 50.5,  $2\frac{1}{2}$  yrs. 59.2; of 1 : 3 plastic mortar, after 7 days 19.2, 28 days 26.5,  $2\frac{1}{2}$  yrs. 32.3 kg. sq. cm. Compression tests were made on cubes of 10 cm. side, cut from the large pieces after 15 yrs. immersion. Results are av. of 6 tests. **Mortars.** To 1 cu. m. sand, 250 kg. Cement No. 1, 213.33, 450 kg. Cement No. 1, 323.5, 650 kg. Cement No. 1, 504.16 kg. sq. cm. 450 kg. Cement No. 3, 480.8, 650 kg. Cement No. 3, 697.5, 1,000 kg. Cement No. 3, 710.83 kg. sq. cm. **Concrete.** 450 kg. Cement No. 3, 1 cu. m. sand, 1.5 cu. m. pebbles, 336.66, 1,000 kg. Cement No. 1, 1 cu. m. sand, 2 cu. m. pebbles, 492.5 kg. sq. cm. LOUIS NAVIAS

**Standard and tentative methods of sampling and testing highway materials.** U. S. Dept. Agr., *Bull.* 949, 98 pp. (1921); *Expt. Sta. Record* 45, 891.—Standard specifications, as recommended and adopted by the second conference of State highway testing engineers and chemists at Washington, D. C., Feb. 23-27, 1920, are given. These include tests for both bituminous and nonbituminous road materials and tentative tests, as well as forms for recording and reprinting results. H. G.

**Practical experiments with various wood preservatives.** ROBERT NOWOJNY. *Z. angew. Chem.* 35, 217-19 (1922).—Results of tests with a large number of com. preservatives are briefly reported and discussed. N. finds that "Basilit" (88.89% NaF and 11.11% picramic acid) is the most satisfactory preservative. The article contains important tabulated data. L. E. WISE

Paint protection for wood (MYERS) 26.

GARY, M.: Deutscher Ausschuss für Eisenbeton. No. 51. Festigkeit von Beton bei wechselndem Sandgehalt der Zuschlagstoffe in erdfeuchtem, weichem und flüssigem Beton. Berlin: W. Ernst & Son. 75 pp. M 105.

MOLL, F.: Investigations on Fundamental Principles in Wood Conservation. Jena: Gustave Fischer. 3 pp.

**Asbestos-cement.** R. V. MATTISON. U. S. 1,423,000, July 18. A mixt. adapted for making shingles or blocks is formed from hydraulic cement, asbestos fiber,  $H_2O$  and heavy petroleum oil.

**Oxychloride cement.** C. CATLETT. U. S. 1,422,337, July 11. Solid lime and solid  $CaCl_2$  are mixed in finely divided condition to form a stable oxychloride nearly free from a tendency to form lumps.

**Treating wood with preservatives.** A. MEYER & P. R. WALSH. U. S. 1,422,119, July 11. One end of a telegraph pole or other piece of timber is immersed in preservative liquid, *e. g.*, creosote oil, and pressure is applied from around the timber to cause penetration of the preservative.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

A contribution to the study of the constitution of anthracite. ARTHUR GROUNDS. *J. Soc. Chem. Ind.* 41, 88-93T(1922).—Six Welsh anthracites were studied. The main constituent (which G. calls  $\psi$ -vitrain) is glossy with conchoidal fracture, resembling vitrain. A clarain-like substance forms 5-10%, and fusain about 1% of the coals. The fusain is of two varieties: one soft, with 5-20% of volatile matter and widely varying ash; and one hard, with more volatile matter and ash. The fusain is sometimes higher and sometimes lower in volatile matter than the associated coal. The  $\psi$ -vitrain has 0.1 to 1.5% ash with a nearly const.  $Al_2O_3 : SiO_2$  ratio of 1.1 : 1.0. The water-sol. part of the ash of the  $\psi$ -vitrain is 1.7-6.9%; of the fusain 9.8-49.5%. Analyses of the fusain and  $\psi$ -vitrain of the coals are given; also analyses of their ashes. E. W. T.

A fundamental study of Japanese coal. CHOZO IWASAKI. *Tech. Reports Tohoku Imp. Univ.* 2, 235-75(1922); cf. C. A. 15, 1384.—The paper is a discussion of the analyses, constitution, phys. properties and classification of coal from various Japanese mines. It does not permit of a short abstract. F. P. PHELPS

Fuel economy and production expenses. ALLEN M. PERRY. *Elec. World* 80, 115-8(1922).—Data are given for elec. plants burning coal, oil, gas and hogged fuel. Careful analysis of data permits interesting comparisons between the results obtained. Today some of the plants are getting back to a net station cost of about \$0.01 per kw.-hr. C. G. F.

The practical economization of coal fuel and the responsibility for it. W. E. APPELBY. *Commonwealth Eng.* 9, 396-404(1922).—A discussion of the principles of fuel saving in boiler plants, presenting charts and formulas for computing losses from  $CO_2$  recorder readings, and the saving effected by economizers. ERNEST W. THIBLE

The Anrep-Moore machine peat manufacturing plant. ANON. *Can. Mining J.* 43, 500-2(1922).—A description of the plant developed at Alfred, Ont., and its operation. Good fuel peat is obtained from a bog contg. 95%  $H_2O$  and only 5% solids. The semi-fluid mass is macerated in a hammer-mill to break down the cell-walls, spread in a thin layer to be sun-dried, and then harvested in blocks, all being done mechanically. A. BUTTS

Relation between the heat value of peat and its degree of decomposition. KEPPFELER. *Mitt. Ver. Förs. Moorkult. Deut. Reiche* 38, 312-6(1920); *Expt. Sta. Record* 44, 720.—Continuing studies on the influence of degree of decompn. on the different properties of peat (C. A. 14, 3518) it was found that the heat values of samples of six different peats, taken at varying depths, corresponded closely with the degree of decompn. as detd. by the so-called percentage-of-total-reduction method previously described. The same general relation was established in studies of mixed samples from individual moors. A close relation was not established between sp. wt. and degree of decompn., owing to



the small variations in the degree of decompn. of the samples used. This feature of the work is being continued.

H. G.

**Solid oil with peat vehicle.** WM. A. HULL. *Petroleum Times* 8, No. 184, 90 (1922).—Peat can be briquetted with Mazant or heavy oil into very satisfactory fuel suitable for any purpose. The cost is very low. The fuel is dustless, leaves little ash and is not very friable.

D. F. BROWN

**Molecular movements during combustion in closed systems.** THOS. MIDGLEY, JR. *J. Soc. Automotive Eng.* 10, 357(1922).—M. gives a theoretical analysis of the exptl. work of Woodbury, Canby and Lewis (*C. A.* 15, 1386). The pressure differential at the flame front suggests itself very strongly as the phys. cause of the effect known as fuel knock or detonation. If this point be accepted, calcns. can be carried further to illustrate practically all of the phenomena which accompany detonation.

D. F. BROWN

**The combustion of fuels in the internal-combustion engine.** T. MIDGLEY, JR. *J. Soc. Automotive Eng.* 7, 489-97(1920); *Expt. Sta. Record* 44, 786.—M. deals briefly with the org. chemistry of internal combustion engine fuels and reviews the results of considerable research into the combustion of fuels in internal-combustion engines, with particular reference to the phenomenon of knock. The opinion is expressed that knock is due to detonation of the gas charge in a cylinder. Fuel studies to det. the order of their tendency to knock showed that the ethers are the worst knockers, followed by the paraffins, which include the fuels in common use. These are followed in order by the olefins, the naphthenes, aromatics, and alcs. The theory of knock suppressors is also discussed.

H. G.

**Tests on the utilization of vegetable oils as a source of mechanical energy.** ANON. *Bull. mat. grasses Inst. Colon. Marseille*, No. 1, 4-14(1921); *Expt. Sta. Record* 45, 690.—Tests by MATHON with palm and cotton oils are reported, in which it was found that the consumption of either fuel by a 4-stroke cycle, 25 h.-p. motor with from 49 to 53 lbs. compression was 265 g. per h.-p. hr., with an explosion pressure of from 359 to 397 lbs. per sq. inch. With a 2-stroke cycle, 16 h.-p. motor with compression of from 22 to 26 lbs. the consumption was 320 g., and with a 2-stroke cycle, 33 h.-p. motor with compression of from 44 to 48 lbs. the consumption was 285 g. The gasoline consumption in all 3 engines was 254, 236, and 240 g., resp., corresponding to a thermal efficiency of about 27%. The thermal efficiencies, vegetable oils being used, were 23, 27, and 25%, resp. Expts. on the gasification of palm oil, by T. d'Aithoff, and on engine operation with this fuel, by Trentels, are also discussed.

H. G.

**Tests of an internal-combustion motor using palm oil fuel.** GOFFIN. *Bull. mat. grasses inst. colonial Marseille*, No. 1, 19-24(1921); *Expt. Sta. Record* 45, 690.—Tests of a 2-stroke cycle gas engine of from 8 to 10 effective horsepower, modified for the use of palm oil fuel, are reported. Water injection into the combustion chamber was provided for. It was found that the motor operated as well on palm oil as on gasoline. The injection of water did not decrease misfiring. The fuel consumption was 340 g. per h.-p. hr., the consumption of injected water about 100 g., and of lubricant about 23 g. The mech. efficiency was about 80 % and the thermal efficiency about 20%.

H. G.

**Palm oil motors.** R. MAYNÉ. *Ann. Gembloux* 26, No. 11, 509-15(1920); *Expt. Sta. Record* 45, 588.—Analyses are given of samples of palm oil for use in internal-combustion engines. This oil is extd. from the pulp of palms and palm fruit, and consists of a mixt. of palmitate and oleate of glycerol with acid in variable proportions. It is yellow or red in color and of a buttery consistency at ordinary temps. The analyses show that the m. p. of palm oil is from 37 to 48° (98.6° to 118.4° F.), so that its practical use as a fuel is apparently limited to torrid climate unless artificial means of preheating are provided. A calorific value of 9,228 calories is given. Data are given show-

ing that the production of palm oil in different parts of West Africa is quite extensive. Preliminary tests of this fuel, especially in semi-Diesel engines, have shown that complete combustion is assured by vaporization of the fuel and injection in quantity strictly proportional to the load. The compn. of the gaseous mixt. should be const., which condition is obtained by the injection of an amt. of water proportional to the load and to the amt. of fuel injected. The scavenging of burned gases should be very effective. Palm oil is shown to have a flash point of about 187° and a burning point of about 210°.

H. G.

**Alcohol as a motor fuel.** ANON. *J. Soc. Automotive Eng.* 10, 364(1922).—Suggested problems for research related to the use of alc. as a motor fuel are stated. A bibliography on alc. as a motor fuel is given.

D. F. BROWN

**The duplex mono chimney gas apparatus.** R. MOELLER. *Power* 54, 64-7(July 12, 1921); *Science Abstracts* 24B, 487.—This app. produces upon the same chart a record of tests for CO<sub>2</sub> and combustible gases in chimney gases, and therefore represents a considerable development in combustion control. On the chart, every other line drawn indicates the CO<sub>2</sub> percentage, while the intermediate lines represent the results of the analyses for CO<sub>2</sub> plus combustibles. The difference in length between any two succeeding lines is therefore proportionate to the amt. of CO and other combustible gases present in the samples, and when using this app. the fireman is not misled by a high CO<sub>2</sub> percentage if this entails loss of combustible matter. The app. contains no moving parts, but Hg is employed to force the gas through the various testing vessels. The CO<sub>2</sub> is first absorbed by KOH in the usual manner and a second sample of the gases is then passed through an elec. furnace attached to the top of the app. The CO, CH<sub>4</sub>, and H<sub>2</sub> are here converted into CO<sub>2</sub> and H<sub>2</sub>O, by aid of the excess O always present in the waste gases and of the Cu oxide contained in the heated tube which acts as a catalytic oxidation agent, and the total CO<sub>2</sub> now present in the gases is again recorded by passing these through KOH soln. The water formed by the reaction is condensed on cooling, and the tests for the CO<sub>2</sub> alone are stated to be accurate to within one-tenth of 1%. A number of charts which were obtained in actual trials of this app. under working conditions are given in the original article, and the inferences to be drawn from the results are set out at length.

H. G.

**Notes on producer gas making.** F. L. ROBERTSON. *J. West Scotland Iron Steel Inst.* 29, vi(1922).—The effort to produce producer gas of a CO<sub>2</sub> content of less than 5% is difficult for most steel plants. The CO<sub>2</sub> content can be controlled in 3 ways: (1) satn. temp., (2) rate of gassification and (3) amt. of poking that can be done. The 3 requirements vary with the plant and fuels used. With a Mond producer the gas made varied under different conditions as stated below. At temp. of satn. of 60° and 10.6 cwt. per hr. the gas analyzed CO<sub>2</sub> 10.0, CO 22, H<sub>2</sub> 18, and CH<sub>4</sub> 2% and with a satn. temp. of 48° and 6 cwt. per hr. of the same fuel the gas analyzed CO<sub>2</sub> 4.5, CO 29, H<sub>2</sub> 11 and CH<sub>4</sub> 2%.

W. A. MUELLER

**The presence of carbon monoxide in the natural gas from petroleum.** EDMOND SCHMITZ. *Mat. grasses* 14, 6157-60(1922).—S. shows that the presence of CO in natural gas is due to the decompn. of naphthenic acids of petroleum. It is safe to assume that where natural gas contg. CO is found petroleum exists, though not in large quantities (e. g., Pechelbronn); while the presence of gas contg. no CO does not necessarily indicate the presence of petroleum; but if the latter does exist it will be in much greater quantities.

A. P.-C.

**Carbonization of peat in vertical gas retorts.** DEPT. OF SCI. AND IND. RESEARCH. Fuel Research Board, *Techn. Paper* 4, 16 pp.(1921); *Science Abstracts* 24B, 485.—Tables are given of the yields and products obtained when peat contg. 20% of moisture was carbonized at temps. varying from 1000 to 820°.

H. G.

**Low-temperature carbonization.** J. H. FRYDLENDER. *Rev. prod. chim.* 25, 185-7, 217-21, 361-6, 397-403(1922).—A review. A. P.-C.

**Preparation and uses of tar and its simple crude derivatives.** W. W. ODELL. *Bur. of Mines, Tech. Paper* 268, 84 pp.(1922). C. T. WHITE

**The nature of the fatty acids obtained by oxidation of lignite tar oil.** E. WENTZEL. *Seife* 44, No. 1-2 (July 13, 1921); *Chimie et industrie* 7, 1176(1922).—By oxidizing lignite tar by means of ozone, Harries obtained acids of com. interest. The constitution of these acids gives an insight into the constitution of the hydrocarbons from which they were obtained. W. used a lignite tar oil boiling between 125 and 200° under a vacuum of 10 mm. The ozonides obtained from this oil were destroyed by means of water and KOH, the fatty acids were liberated, distd., esterified, and the esters rectified *in vacuo*. Stearic, myristic and palmitic acids were subsequently isolated, and enanthic and octylic acids are probably present. Among the water-sol. acids are formic, AcOH, propionic and oxalic. The absence of  $C_6H_5O_2$  and of  $C_6H_{12}O_2$  should be noted. The mixt. of acids is analogous to that obtained from coconut oils. Certain fractions of the acids, when neutralized with NaOH, have a good foaming power. A. P.-C.

**Chemistry of the coking process; observations on the manufacture of a high melting bitumen and its application in making a metallurgical coke from non-coking coal.** FRIEDRICH LIEBIG. *Z. angew. Chem.* 35, 264-8(1922).—The action of the addn. of pitch in coking of non-coking coal was investigated and certain facts were established. The most favorable operation of the coking of coal with the addn. of pitch is increased considerably by its addn. in dissolved form, but favorable operation is not established at first because of the necessarily longer time of carbonization of the pitch which tends to nullify the easy melting first obtained. The ext. from treating the coal with pyridine showed no m. p. and decomposed on further heating. Additional coking of this residue gave a puffed up residue of about 40% of the mixt. used, while the extd. coal produced little gas on coking. By mixing the powd. extd. material with the extd. coal in the original proportions, the original coking properties of the coal were not reproduced. A high m. p. material was made for coal tar pitch, with the purpose of extg. the coal and yielding a coke of satisfactory properties. The intermediate soln. contained only small amts. of elementary C with a much larger quantity of hydrocarbons of high mol. wt. The coking of various grades of pitches with non-coking coal produced a coke which compared well in form and appearance with coke produced from coals of varying coking properties. The phys. nature of these pitches and their mode of acting will correspond to the method of synthesis from the original coal. In the absence of sufficient free C in the pitch it is possible to increase the amt. by blowing with air. While a mixt. of 50% of a good coking coal with non-coking coal gave a product that would not hold together, a mixt. of 25-30% of high m. p. pitch with non-coking coal produced a good quality coke. By using the pitch in a partially dissolved form a satisfactory mixt. could be obtained with 8-9% pitch. ARTHUR L. DAVIS

**By-product coking.** F. W. SPERR, JR. *J. Ind. Eng. Chem.* 14, 844-6(1922).—A review. E. J. C.

**The composition and utilization of exhausted molasses in Mauritius (TEMPANY, D'AVOINE) 28. Gas from strawboard factory waste waters (HERMANN) 23. Toxic effect of illuminating gas upon plants (PRIESTLY) 11D. Action of coal gas on plants (WEHMER) 11D.**

SAINT-CLAIRE-DEVILLE, E. : *Methodes et procédés des essais et analyses en usage à l'usine expérimentale de la Villette de la Société du Gaz de Paris.* Paris: Dunod. 208 pp. F 17.50. Reviewed in *Chimie et industrie* 7, 1039(1922).

**KEPPLER, GUST:** *Die Brennstoffe und ihre Verbrennung.* München & Berlin: R. Oldenbourg. 60 pp. M 40.

**SEXTON, A. HUMBOLDT:** *Fuels and Refractory Materials.* Revised and enlarged edition. Edited by W. B. Davidson. New York: Van Nostrand Co. 382 pp. \$4. Reviewed in *Am. Gas. J.* 116, 561(1922).

**Solid fuel.** W. W. STRAFFORD and S. PICK. Brit. 176,822, Sept. 16, 1920. Carbonaceous materials such as anthracite or coke are ground and mixed with  $\text{BaCO}_3$  and, preferably, charcoal and the mixt. is treated with tar from coal, water-gas or blast furnace gas in sufficient quantity to bind the mass together and then heated in a retort. Tar is distd. off which is free from pitch and free C and a smokeless fuel product obtained.

**Apparatus for continuous drying of peat, chips or other fuel.** O. NORDSTROM. U. S. 1,423,728, July 25. The fuel is fed downwardly through a drying tower and treated with a countercurrent of hot gases.

**Apparatus for combustion of powdered coal.** JIRÔ HAMAI. Japn. 39,575, Aug. 18, 1921. Diagrammatical description. The powdering app. is protected from destruction by hard substances mixed in the coal.

**Fuel.** J. PENHALE. Brit. 178,373, July 19, 1921. Alc. fuels consisting of EtOH substantially satd. with a hydrocarbon gas such as acetylene have their explosive power increased by the addition of ethyl or methyl nitrate. The preferred proportions are such that the nitrates do not exceed 1% by vol. of the total.

**Recovering constituents of gaseous hydrocarbon mixtures.** G. O. CURME, JR. U. S. 1,422,182, July 11. Mixts. such as  $\text{C}_2\text{H}_2$  mixts. obtained by electrothermic decompn. of liquid hydrocarbons are compressed, brought into contact with a solvent such as acetone at a temp. below atm. temp. (preferably about  $-30^\circ$ ) to ext.  $\text{C}_2\text{H}_2$  or other sol. constituents and the gases are drawn off. The absorbed constituents are fractionally recovered from the solvent by progressive distn., and rectification of the absorbed substances is effected. U. S. 1,422,183 relates to a similar method adapted for recovering  $\text{C}_2\text{H}_4$  from natural gas. U. S. 1,422,184 relates to recovery of  $\text{C}_2\text{H}_4$  from gas mixts. by compressing the gas and treating it with a countercurrent of an absorbent such as acetone from which the  $\text{C}_2\text{H}_4$  is then recovered by reduction of pressure on the soln.

**Liquid fuels.** B. R. TUNISON. U. S. 1,423,048, July 18. A liquid fuel which is of greater d. than kerosene and adapted for use in internal-combustion engines is formed of alc., acetone, ether and a relatively heavy aliphatic hydrocarbon such as a mineral oil distillate heavier than kerosene. U. S. 1,423,049 relates to liquid fuels formed from petroleum distillates heavier than kerosene (e. g., a distillate of  $28-40^\circ$  Bc.) and about a third as much EtOAc or other organic acid ester, with or without alc.

**Liquid fuel.** B. R. TUNISON. U. S. 1,423,050, July 18. A fuel for internal-combustion engines is formed of oil of  $28-40^\circ$  Bc., or other petroleum distillate heavier than kerosene, 75 and an aromatic hydrocarbon such as  $\text{C}_6\text{H}_6$  20-25, with or without  $\text{PhNO}_2$  5 parts.

**Fuel for internal-combustion engines.** M. C. WHITAKER. U. S. 1,423,058, July 18. Alc. 20 parts or more is mixed with  $\text{C}_6\text{H}_6$  17-35, gasoline 20-60 and EtOAc 5-20 parts.

**Apparatus for purifying coal gas by scrubbing.** A. L. STEVENS. U. S. 1,423,696, July 25.

**Water-seal for gas retorts.** A. W. WARNER. U. S. 1,423,975, July 25.

**Producing gas from lignite.** E. M. BRAXTON. U. S. 1,424,077, July 25. A bed

of lignite is ignited over a conical grate while rotated to form gas. The gas is superheated near the apex of the grate and then led off to be cooled, cleaned and dried.

**Gas producer.** L. FORNAS. U. S. 1,422,063, July 11. Heated air and fuel which pass through a drier within the air heating chamber are supplied to a combustion chamber which heats the air and fuel.

**Water-jacketed gas producer.** J. WELLS. U. S. 1,422,643, July 11.

**Gas manufacture.** G. P. LEWIS. Brit. 177,556, Oct. 1, 1920. Materials such as coal, shale, lignite, peat, wood, nutshells, etc., are distd. in a retort to a max. temp. of about 1300° and the residue is gasified in a gas producer. Part of the gas from the producer is burned in flues surrounding the retort, part led away for NH<sub>3</sub> recovery, and the remainder passed through the retort together with steam or moist air from drying of the charge. A suitable construction is specified.

**Gas manufacture.** G. P. LEWIS. Brit. 177,559, Oct. 28, 1920. Addition to 177,556, (preceding abstract). In a gasification process as described in the principal patent in which carbonaceous material is distd. in a retort, the residue being gasified in a producer and in which rich gases are withdrawn from the retort and power gas from the producer, a portion of the power gas being passed through the retort, the passage of the coke from the retorts to the producer is through hopper chambers and is facilitated by rotating rollers. Boric compds. may be added to the charge and the alkalis added may be the crude Na or K salts found in Chili. An annular water space is arranged in the producer shell for furnishing a supply of steam for the producer and retort.

**Carbonizing.** F. STANSFIELD. Brit. 177,588, Dec. 2, 1920. The destructive distn. of carbonaceous or other material is effected by allowing thin layers of crushed material to slide by gravity from a hopper down divided parallel channels on the inclined floor of the retort. The floor is heated so that the material passes through zones of increasing temp. and the rate of progress of the material is regulated by varying the rate of withdrawal of material from the lower end of the retort. The evolved gases are drawn off directly above the material, through a series of outlets in the cover of the retort, from a no. of compartments. The treated material may be drawn off either continuously or intermittently at the lower end of the retort. Two or more parallel series of adjustable baffles supported by side plates adapted to rest on the inclined floor of the retort cause repeated agitation of the material and control the thickness of the layer.

**Carbonizing processes.** G. POLYSIUS. Brit. 178,126, Jan. 10, 1921. Addition to 157,318 (C. A. 15, 1987). In an improvement in the method of internally heating a rotary retort for the low-temp. distn. of coal, etc., by means of gas from the retort, which gas circulates in a closed system, and is heated by passing through the coke-shaft as described in the principal patent, the gas is diverted by a funnel in the upper part of the coke-shaft into a regenerator where it passes through tubes, heated externally by gases from a burner, and from which it passes, at the required temp. and without mixing with the waste products of combustion, into the retort. Excess gas from the closed circulating system, by-passed through a valve, is led to the burner nozzle of the regenerator. The waste gases from the regenerator are used to heat the retort externally.

**Low-temperature continuous distillation of fuel.** A. C. MICHIE and E. G. WEEKS. U. S. 1,423,134, July 18. Hot gases are passed through a body of coal or other fuel which is fed with successive charges of material which have been preheated by contact with steam or waste gases to such a temp. that they will not effect condensation of distillate when introduced into the distg. chamber.

**Distilling coal.** A. W. HELMHOLTZ. U. S. 1,422,706, July 11. A mass of coal is heated until it assumes a plastic condition (by-products being driven off during the heating) and oil is then added to the mass to control its volatile content and it is heated

at a higher temp. for recovery of additional by-products and finally compressed to obtain a firm coke.

**Distilling sulfur-bearing carbonaceous material.** W. THOMAS. U. S. 1,422,496, July 11. Fuel such as coal contg. S is heated to the distg. point in a vertical retort while purified coal-gas is injected into the charge at different levels to assist in distn. and carrying off by-products to be recovered.

**Retorts.** E. BARRS. Brit. 177,239, Dec. 20, 1920. In a retort for the low-temp. distn. of coal, etc., the working bottom is composed of coal and has embedded in it flues whereby the retort is heated.

**Coking chamber for gas producers or generators.** P. JAWORSKI. U. S. 1,422,206, July 11. The chamber is provided with a common inlet for generator gases and outlet for coked material to the producer.

**Coking coal.** S. R. ILLINGWORTH. U. S. 1,422,269, July 11. See Brit. 164,104, (C. A. 16, 1312).

**Coke-oven retort with a reciprocating floor.** L. L. SUMMERS. U. S. 1,422,634, July 11.

**Ammonium sulfate; ammonia.** SOUTH METROPOLITAN GAS CO. AND P. PARRISH. Brit. 177,726, April 27, 1921.  $(\text{NH}_4)_2\text{SO}_4$  is neutralized by a soln. of  $\text{NH}_3$  obtained in the following manner from the waste effluent from the "fixed"  $\text{NH}_3$  still. A suitable app. is specified.

**Ammonium sulfate; pyridine.** SOUTH METROPOLITAN GAS CO. AND P. PARRISH. Brit. 176,977, Jan. 24, 1921. Neutral  $(\text{NH}_4)_2\text{SO}_4$  is obtained by passing  $\text{NH}_3$  from the "free"  $\text{NH}_3$  still into one saturator, which is maintained acid, and the  $\text{NH}_3$  from the "fixed"  $\text{NH}_3$  still into a second saturator which is worked so that a neutral or alk. reaction is obtained. Acid crystals from the first saturator, after treatment in a centrifugal to remove another liquor, are transferred to the second saturator in which complete neutralization is effected. The crystals from the second saturator are treated in a second centrifugal, so as to avoid the action of both acid and alk. liquids on the same centrifugal. The pyridine is contained in the gases leaving the second saturator and is recovered in known manner. Cf. C. A. 16, 1859.

**Ammonium sulfate.** R. LESSING. Brit. 178,046, Oct. 6, 1921. In the manuf. of  $(\text{NH}_4)_2\text{SO}_4$ , the paste of crystals discharged from the saturator is allowed to drain under conditions which prevent further crystn. during the draining process. Preferably the paste is discharged into a closed draining vessel, which is heated to a temp. not above that of the crystals. The process may be carried out in conjunction with that described in 152,766, (C. A. 15, 929) for improving the color of  $(\text{NH}_4)_2\text{SO}_4$ .

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**South America looming as an oil producer.** W. O. FANNING. *Oil & Gas J.* 21, No. 9, 11, 82(1922).—Description of the conditions obtaining in the oil industry in the various South American countries. Two grades of oil are produced in Peru, a low cold test oil and a high cold test oil. The latter is very similar to Penna. crude.

D. F. BROWN

**Significance of England's oil shales.** H. E. AKROYD. *Petroleum Times* 7, 576 (1922).—The great profits of the oil industry have hindered scientific investigation in this industry. The Scottish industry has treated the shale almost entirely for  $\text{NH}_3$  and paraffin. The industry must be reorganized so as to make these by-products. S can now be easily eliminated. The externally heated retort is being replaced by in-

ternally heated retorts. Superheated steam heated to not more than 400° will be the medium used for the distn. This results in a higher yield of  $\text{NH}_4$ . Oil from shale is highly unsatd. but easily converted into 90% satd. Its high content of aromatics enhance its value as a motor fuel. Present cracking methods are not good but the use of hyzone ( $\text{H}_2$ ) discovered by Bergius appears to make this process more efficient.

D. F. BROWN

**The oil shales of Esthonia.** E. H. C. CRAIG. *Petroleum Times* 7, 673, 697(1922).—The mineral matter in the shale has the compn. of fullers earth and limestone. The yield of oil per ton is high, theoretically being over 90 gal. per ton. Distn. does not begin at low temps. but when it does begin it is very rapid and is completed under 450°. C. does not believe distn. of this shale in a vertical retort to be practical. Different theories as to the origin are discussed. C. ests. 1000 million tons of shale to be present in these deposits, which would yield from 70 to 80 gal. per ton of 0.92 to 0.93 sp. gr. oil contg. little S and easily refined. Solid paraffin will be almost entirely absent. D. F. B.

**The newer methods of shale oil extraction.** A. E. VON GROELING. *Petroleum Z.* 18, 487-493, 539-545(1922).—The various processes in use for the extn. of shale oil are described and their merits are discussed.

D. F. BROWN

**Internally heated retorts.** NAT. H. FREEMAN. *Petroleum Times* 8, No. 184, 86(1922).—Internally heated retorts for the shale industry are not practical from the theoretical standpoint.

D. F. BROWN

**Natural gasoline specifications.** ANON. *Petroleum Age* June 15, 1922, 41.—Specifications for 5 grades of natural gasoline and 4 grades of motor natural gasoline are given as compiled by the Specifications Committee of the Assoc. of Natural Gasoline Mfgs. of Tulsa, Okla.

D. F. BROWN

**Vapor pressures of high grade gasoline and kerosene.** ANON. *Petroleum Age* 9, No. 12, 37(1922).—Table of vapor pressures of gasoline and kerosene from 0° to 80° is given.

D. F. BROWN

**Method of correcting volume of oil for temperature variations.** T. G. DELBRIDGE. *Nat. Petroleum News* 14, 41-42(1922).—Tables are given for connecting the vol. of oil at different temps. to the vol. at 60° F.

D. F. BROWN

**Temperature-pressure curves of petroleum products.** M. B. COOK. *Petroleum World* 19, 313-14; *Oil News* 10, No. 14, 41; Bur. of Mines, *Rept. of Investigations* No. 2368, 2 pp.(1922).—A bomb was constructed from a hexagonal piece of steel bar, of  $2\frac{1}{2} \times 6$  in. outside dimensions without cover, to carry working load of 1000 lbs. per sq. in. with a factor of safety of 20. A machined cap  $\frac{5}{8}$  in. thick was screwed over the end of the bomb holding a lead gasket in a groove in place by a rim in the cap. A pressure gage mounted on a  $\frac{3}{4} \times 6$  in. brass nipple of  $\frac{1}{4}$  in. bore was screwed into the center of the cap. The inside dimensions were  $1\frac{1}{2} \times 5\frac{1}{8}$  in. with a total capacity of 160 cc. The bomb and contents were heated in a bath of steam cylinder oil which was stirred thoroughly. A blank, using distd.  $\text{H}_2\text{O}$ , gave concordant results. One sample of casinghead gasoline, two of motor gasoline, one of kerosene and one of transformer oil were heated and the pressure was recorded with increasing temp. Distn. was made by A. S. T. M. method. In general, the pressure generated by petroleum products when subjected to elevated temp. varies inversely with the av. b. p. of the product.

ARTHUR L. DAVIS

**When is oil "good?"** WM. F. PARISH. *J. Inst. Petroleum Tech.* 8, 224-9(1922).—An address. Oils must be suited for the conditions of service which they are to meet. The dilution of the lubricating oil in the crank case of an internal-combustion engine by the fuel used is considered, and the problem of reclaiming the didd. oil is discussed briefly.

W. F. FARAGHER

**Methods for testing petroleum products.** ANON. Bur. Mines, *Tech. Paper No. 298*, 58 pp.(1922).—The official methods used in testing and inspecting petroleum products which are bought under Federal specifications. These methods supercede those issued by the Committee on Standardization of Petroleum Specifications which were published as Bulletins 1-5 by the Committee.

W. F. FARAGHER

**Analysis of Czechoslovakian petroleum.** F. SCHULZ. *Petroleum Z.* 18, 321-3 (1922).—Gbely petroleum is similar to certain types of Louisiana oil. It is distinguished by the fraction from 150° to 200° which has the odor of terpenes. This is due to the presence of hydrocarbons of the  $C_nH_{2n-4}$  series instead of terpenes. This oil is heavier than Louisiana oil and optically active. It contains no paraffin wax. On distn. with superheated steam the flash point of both distillate and residue rises very slowly and the latter soon acquires a high viscosity but does not form asphalt. Hodonin oil is identical with Gbely oil. Oils from Bohuslavice, Turzovka, and Mikova resemble the best Pennsylvania oils, are almost free from asphalt and contain but about 0.025% of S. At 300° the residue is a light transparent vaseline of setting point 26-28°. The Mikova oil contains more asphalt than the other two oils. This is easily sepd. with alc. ether.

D. F. BROWN

**Apparatus for determining resistance to cold of mineral oils.** K. GLASER. *Petroleum Z.* 18, 81-2(1922).—A vessel partly filled with  $H_2O$  is placed above a small vessel contg. a freezing mixt., thermometer, and stirring app. The second vessel is surrounded by another vessel contg. ice. Glass siphons hang from the first vessel, the upper ends dipping into the  $H_2O$  and the lower ends, bent into a U shape, are immersed in the freezing mixt. The oils to be examd. are introduced into the graduated lower limbs of the siphon tubes, and subjected to a temp. of -10° for 1 hr. A stop watch is then started by a lever and simultaneously a displacement body falls into the vessel contg.  $H_2O$ , raising the level of  $H_2O$  50 mm. In 1 min. the siphons are withdrawn and the amt. of rise in level of oil is read off.

D. F. BROWN

**The solid paraffins in petroleum.** M. A. RAKUSIN. *Petroleum Z.* 18, 5-9, 42-8 (1922).—Grosny petroleum contains a relatively high % of solid paraffins and hence expts. were made to find a suitable method for extg. the solid paraffins. Centrifuging and filtering through both Chambuland and Pukal filters were tried as well as treating with the absorbents kaolin, powd. filter plate and fullers earth at ordinary and also high temps., and at normal, reduced and increased pressures. No method effected complete sepn. but it was found that centrifuging removed 2.6% of solid paraffins of m. p. 69° and sp. gr. 0.8974, and treatment of the residual oil with 10% fullers earth absorbed 0.95% of m. p. 50° and sp. gr. 0.8108 and there remained in the oil 1.70% of an intermediate fraction of m. p. 59° and sp. gr. 0.8377 which could be extd. only by Holde's distn. method. The resin content of the oil was reduced by centrifuging, vacuum filtration, and treatment with fullers earth under pressure, but remained unaltered by treatment with absorbents under normal or reduced pressure. The two fractions of solid paraffins sepd. from the cold oil by centrifuging and extn. with fullers earth were of a cryst. nature, proving that they do not exist in the crude oil as amorphous or "proto-paraffins." They are not, therefore, converted by heat from amorphous to cryst. or "pyro-paraffins."

D. F. BROWN

**The naphtha-bearing terrains of Turzkovkam in the White Carpathians.** J. J. JARN AND E. SCHNABEL. *Petroleum Z.* 18, 441-7(1922).—Samples of crude oil taken from a depth of 186.7 m. analyzed as follows: odor, petroleum, not unpleasant; color, yellow brown with green fluorescence, in thin layers it is transparent;  $d_{40}$  0.834; stiffening point 9°; flash point (Pensky test) 65°. Distn. gave 67.9% at 360°. The light oil fraction (150-250°) had  $d_{15}$  0.757, and a flash point of 38.5° (Abel test). Paraffin content in the crude oil was 7%. This oil gave on refining, benzine to 0.733, 14.8%;



naphtha to 0.806, 50.3%; lubricating oil 0.866, 30%; asphalt and paraffin 4.6%; loss 0.3%; stiffening point of the lubricating oil 23°. This oil belongs to the type of Pennsylvania crudes with a paraffin base contg. no asphalt and very little S. Because of its high benzine and petroleum content it is equal to the best Penna. grades. D. F. B.

**Color of petroleum mixtures and paraffin wax.** M. BOMBERG. *Petroleum Z.* 18, 361-3(1922).—The Stammer color value of petroleum mixts. may be calcd. fairly accurately by taking the reciprocal of the sum obtained by adding the ratios of the fractional proportions of the constituents to their respective color values. The color of paraffin wax may be calcd. by comparing, in a Stammer app., the light reflected from a plane surface of a piece of wax 1 cm. thick with that transmitted by a standard soln. of  $K_2Cr_2O_7$ . Crude paraffin wax treated with 4% of different bleaching agents gave color values as follows: tonsil 5; animal charcoal 25.5; Frankonit 40.5; floridin 1, 52; floridin 11, 85; fullers earth 246.

D. F. BROWN

**The influence of the elements of the oxygen group on paraffin.** H. SIEBENCK. *Petroleum Z.* 18, 281-286(1922).—Both air and O attack paraffin if bubbled through the material heated to 135°. After 10 hrs. acid vapors are evolved, and after 22 hrs. the product contains 30-40% of saponifiable matter according as air or O is used. It is possible to obtain up to 52.65% saponifiable matter having an acid value of 59.03 and an ester value of 93.91. This indicates about 30% free and 70% esterified acids. Saturated fatty acids are produced. The volatile portion of the product consists of lower members of the same series together with  $H_2O$  and amts. to about 7% of the paraffin used. Hard paraffin heated with S commences to evolve  $H_2S$  at 150°. This is evolved freely at 230° together with  $CS_2$ . After 7 hrs. treatment at this temp. the residue is a brownish black mass from which an amorphous black substance contg. almost no H and corresponding closely to the formula  $(C_8S)x$  is obtained by extr. first with  $CS_2$  and then with ether. This substance is indifferent to alkalis and org. solvents but is attacked by concd.  $H_2SO_4$  or  $HNO_3$ . Similar results were obtained with Se and Te except that higher temps. were required and no Se or Te compd. corresponding to the S compd. was obtained. Small quantities of S or Se inhibit the action of O on paraffin.

D. F. BROWN

**The probability of reaction between sulfur and solid paraffin in the mineral oil-bearing regions.** M. A. RAKUSIN. *Petroleum Z.* 18, 581-2(1922).—In a small glass bulb immersed in an oil bath at 190° to 205°, paraffin, m. 56°, was treated for 18 hrs. with a weighed amt. of S. The  $H_2S$  evolved was collected in a U tube filled with pumice stone and  $NH_4OH$ . The train was completed by another U tube filled with  $CaCl_2$ . Any S which sublimed was converted into polysulfides of ammonia in the first tube, from which it was pptd. out by HCl. From the data obtained it is concluded that less than 50% of the S taken in the expt. or 3.12% of the wt. of the paraffin taken entered into the reaction. This agrees well with earlier expts. and indicates that in those petroleum deposits where there are petroleums contg. paraffin and those free of paraffin, the S content must be the smaller in the latter. Analysis proves this to be so.

D. F. B.

**Wax extraction by centrifugal force.** WALTER MILLER. *Oil & Gas J.* 21, No. 7, 14-15(1922).—A resumé of purification methods is given.

D. F. BROWN

**Tar sand experiments in the Athabaska field.** G. A. INGS. *Oil & Gas J.* 21, 92(1922).—Runs from a 50 bbl. plant show that oil can be produced from the Athabaskan tar sands for \$0.35 per bbl. The crude oil contains an av. of 14% gasoline, 45% kerosene, and 5% residue, chiefly bitumen. Three processes are used, retorting, extr. by sepn., and distn. on the ground. Exponents of each process claim it to be feasible.

D. F. BROWN

**Durable foam seal stops evaporation and reduces fire risk.** PAUL PRUESDELL. *Nat. Petroleum News* 14, No. 28, 43(1922).—Sealite, composed of corn starch, glycerol,

gelatin and other ingredients, and about 50% air floats on the surface of oil in the storage tank preventing evapn. During manuf. of the compound it is beaten into a very fine form resembling a solid and in this form it is very light and durable. In lab. tests attempts to fire containers of oil sealed with sealite have been unsuccessful and it is claimed that it will be broken only when heat sufficient to cause boiling of the oil is applied. It readily dissolves in  $H_2O$ . D. F. BROWN

**The Turner internally heated retort.** J. C. D. MACKENZIE. *Petroleum Times* July 1, 1922, 15.—A description of this app. for distg. shales. D. F. BROWN

**Fleming process is found successful by Sterling O. & R. Co.** V. B. GUTHRIE. *Nat. Petroleum News* June 28; 1922, 23.—The complete time cycle of running was 70.3 hr, charge 580 bbl., yield 270 bbl. light distillate of 53.6° Bé., 69 bbl. heavy distillate of 36° Bé., 194 bbl. still bottoms of 20.7° Bé., coke 1150 lbs., loss 4.8%. 75% of the light distillate was distd. over at 419° F.; 35% of the total charge was obtained as gasoline and 12.5% as kerosene. D. F. BROWN

**Composition of a bituminous limestone from Lovagny.** H. GAULT and L. BOISSELET. *Mat. grasses* 14, 6156(1922).—The following analytical results were obtained: bitumen 4.46%, volatile at 100° 2.3, ash 93.3. Analysis of ash:  $Al_2O_3$  0.82,  $Fe_2O_3$  0.62,  $CaCO_3$  97.60,  $CaSO_4$  0.48,  $MgCO_3$  0.44. A. P.-C.

**Composition of bituminous limestones from Syria.** H. GAULT, L. BOISSELET and M. PFERSCH. *Mat. grasses* 14, 6156-7(1922).—Examn. of 2 samples showed them to consist of the remains of Foramenifera, formed in deep water during the Cretaceous period. The following results were obtained for the 2 samples, resp.: moisture 0.52, 0.3; S 1.495, 0.65; P 0.195, 0.10; ash 81.90, 91.00; N 0.44, 0.52. Distn. test: water 1.84, 1.1; coke 89.10, 95.02; crude oil 5.90, 1.76; volatile matter 3.16, 2.12; upper calorific value of the moist gas at 0° and 760 mm. 2,777 cal., 2,365 cal. In both cases the aq. distillate was slightly ammoniacal, and the ash contained  $H_2S$ ,  $H_2SO_4$ ,  $H_3PO_4$ , HCl,  $SiO_2$ ,  $CO_2$ , Fe, Al, Ca, Mg, Na. A. P.-C.

**Turpentine.** J. O. CLARKE. *J. Assoc. Official Agr. Chem.* 5, 547-53(1922).—On account of the varying results obtained by the several workers, it is recommended that the fuming  $H_2SO_4$  method be further studied with especial attention to the prepn. of the reagent and reformulation of procedure, as outlined in the report; furthermore, that the method of Grotlich and Smith for the detn. of coal tar oils in turpentine be studied. W. O. E.

**Asphaltic substances in lignite producer tar.** J. MZOUREK. *Petroleum Z.* 18, 77-81(1922).—M. treated 500 g. of tar with 500 cc. light petroleum spirit and allowed the mixt. to stand 2 hr. After decantation the ppt. was rewashed with the spirit until the residue, a thick, black asphaltic substance, was completely insol. The spirit was then removed by distn. and heating on a steam bath. 48% of asphaltic constituent was obtained. It was a shining black substance, with a conchoidal fracture, m. p. 56°, flash point 160°, burning point 183°, paraffin content (Holdes method,  $-10^\circ$ ) 2.3%; 42.3% sol. in 15% NaOH soln. and gave on cracking 41% of oil, 47% of coke, and 12% of loss. In addn. to the asphaltic constituent, 52% oil of sp. gr. 0.9203, viscosity 5.78°, Engler at 50°, flash point 88°, burning point 170°, and cold test 30.5° was obtained. cf C. A. 15, 1988. D. F. BROWN

**Asphalt deposits of Lattakia.** E. MARCKWALD. *Petroleum Z.* 18, 165-70(1922).—Results of 55 tests on samples of asphalt from different sections of Lattakia are recorded. These are divided into six groups according to their uses, as follows: I low asphalt content; II binder asphalt; III soft binder and varnish asphalt; IV mixing and varnish material; V mixing and varnish material, softening point 30-40°; VI latquer asphalt melting under 100°. The percentages of the  $CaCO_3$ ,  $MgCO_3$ ,  $Fe_2O_3$ ,  $Al_2O_3$ , and  $SiO_2$  present in each group together with the softening point of the bitumen are

given. The tests indicate that the asphalt deposits of Lattakia would be extremely valuable if properly opened and worked.

D. F. BROWN

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Distilling [shale] (Brit. pat. 176,847) 13.

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CAMPBELL, ANDREW: *Petroleum Refining*. 2nd Ed. revized. New York: Petroleum Age, 56 W. 45th St.

DAY, DAVID T.: *Handbook of the Petroleum Industry*. New York: John Wiley & Sons. 2070 pp. \$15.

EVANS, E. A.: *Lubricating and Allied Oils*. London: Chapman and Hall, Ltd. 128 pp. 9s. 6d. Reviewed in *Nature* 110, 75.

*Oil and Petroleum Manual*, 1922. Edited by Walter R. Skinner. 13th issue. London E. C. 4: Walter R. Skinner, 15 Dowgate Hill. Cannon St. 8s. 6d.

*Petroleum Industry*. Edited by A. E. Dunstan. London. W. C. 2: Institute of Petroleum Technologists, 5 John St., Adelphi. Reviewed in *Petroleum Age* 10, 96(1922) and *Engineering* 113, 731(1922).

*Petroleum Yearbook*, 1922. Los Angeles: Petroleum World Publishing Co. 144 pp. \$5. Reviewed in *Petroleum Age* 10, 96(1922).

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Recovering sulfur from mineral oils. J. C. CLANCY. U. S. 1,423,711, July 25. S-bearing oil is treated with liquid  $\text{NH}_3$  and  $\text{O}_2$  or  $\text{NH}_4$  persulfate and the resulting  $(\text{NH}_4)_2\text{SO}_4$  is crystd.

Desulfurizing mineral oil. J. C. CLANCY. U. S. 1,423,712, July 25. The oil is heated with  $\text{NH}_3$  vapor and steam in order to drive out S as  $(\text{NH}_4)_2\text{S}$ . Cf. C. A. 16, 1148.

Desulfurizing oil. J. C. CLANCY. U. S. 1,423,710, July 25. Petroleum oil is treated with liquid anhydrous  $\text{NH}_3$  in the presence of a catalyst such as Na, K, Ca or Ba to form a compd. of the  $\text{NH}_3$  with S present in the oil and this compound is sep'd. from the oil by washing with  $\text{H}_2\text{O}$ .

Cracking petroleum hydrocarbons. R. CROSS. U. S. 1,423,500, July 18. Kansas gas oil or a similar oil is passed through a comparatively small pipe in a furnace where it is heated to cracking temp. and is discharged into a closed insulated chamber where further cracking takes place. The evolved gases serve to maintain pressure on the oil sufficient to assist in cracking and to prevent substantial vaporization of the oil as it is passed through the app. employed continuously.

Cracking hydrocarbons. J. C. CLANCY. U. S. 1,423,709, July 25. Hg vapor is used as a catalyst to effect cracking of hydrocarbons such as kerosene in the vapor phase to produce gasoline.

Motor fuel from petroleum. O. P. AMEND. U. S. 1,423,064, July 18. A colorless motor fuel which has a sp. gr. above 0.74, a Br absorption no. above 125, a flash point below  $0^\circ\text{F}$ . and over 50% of which is volatile at temps. below  $80^\circ\text{C}$ . is obtained by cracking heavy oils with catalysts. The fuel contains not less than 30% of naphthene hydrocarbons and is free from terpenes or resinous substances.

Fuel oils. R. H. BROWNLEE and C. F. DE GANAHL. Brit. 177,589, Dec. 23, 1920. Oils of high viscosity are treated to reduce their viscosity and render them suitable as fuel oils, by heating the oil to  $675\text{--}825^\circ\text{F}$ . by passage through a series of tubular stills or rotary retorts, the vapors formed in each still being removed and condensed separately. The heating is effected under pressure preferably of 3-5 atm. A suitable construction is specified.

Distilling oil from shale. G. McD. JOHNS. U. S. 1,423,527, July 25. Pulverized

oil-bearing shale is fed in a continuous layer of even thickness over a heated inclined surface to effect distn. of oil.

**Distilling oil-bearing shale.** E. E. HEDGES. U. S. 1,423,716, July 25. Raw shale is introduced into one end of an elongated retort and moved along through the retort under const. agitation while it is gradually heated to a temp. suitable for production of water gas. The gases released from the shale are conducted countercurrentwise to the passage of the shale and steam is caused to react upon the fixed carbonaceous residuum of the shale at the hottest end of the retort and the gas thus produced is mixed with the gas distd. from the shale at lower temps.

**Treating sludge acids.** I. HECHENBLEIKNER and T. C. OLIVER. U. S. 1,423,766, July 25. Weak sludge acid such as is obtained in refining petroleum oil with  $\text{H}_2\text{SO}_4$  is concd. to 57° Bé. by heating to about 132° while agitating the acid and is then heated to a higher temp. (about 182°) without agitation in order to conc. it to 66° Bé. U. S. 1,423,767 relates to a similar process. Cf. C. A. 16, 2937.

**Apparatus for purifying gasoline by chemical treatment.** W. J. SEDELBAUER. U. S. 1,423,970, July 25. Strong NaOH soln. is used to ppt. dyes from gasoline used for cleaning dyed fabrics.

**Receptacle for gasoline.** C. A. CLEGHORN. U. S. 1,422,670, July 11. Gasoline containers made of material such as rubberized fabric which would ordinarily be attacked by the gasoline are coated with Turkish birdlime to protect it from such attack.

**Foam for preventing evaporation of petroleum oil or other stored liquids.** J. M. JENNINGS. U. S. 1,423,719, July 25. Foam is formed of an aq. soln. contg. glycerol 10%, glue 25%,  $\text{FeSO}_4$  2% and a small amt. of a preservative, e. g.,  $\text{HgCl}_2$ . U. S. 1,423,720 relates to production of foam from a soln. comprizing  $\text{H}_2\text{O}$  7, glue 6.5, glycerol 65,  $\text{CaCl}_2$  20,  $\text{FeSO}_4$  1 and mineral oil sulfonate and soaps 0.5%. U. S. 1,423,721 covers foam production from a compn. of  $\text{H}_2\text{O}$  6–12%, glucose 40–81%, glue 5–10%, glycerol 40% or less and a small amt. of a "setting agent" such as  $\text{FeSO}_4$  and  $\text{HgCl}_2$ .

**Distilling wood.** R. PERRE. Brit. 177,177, March 18, 1922. The wood is arranged in heaps, each of which is in turn distd. by partial combustion, in a manner similar to the heaps used by charcoal burners, the distillates being drawn off and treated for recovery of by-products. A suitable construction is specified.

**Furnace for manufacturing charcoal.** EIJIRO KOJIMA. Japn. 39,589, Aug. 19, 1921. Diagrammatical description.

## 23—CELLULOSE AND PAPER

CLARENCE J. WREST

**Comparison of wood cellulose and cotton cellulose.** S. A. MAHOOD AND D. E. CABLE. *J. Ind. Eng. Chem.* 14, 727–31 (1922).—The wood cellulose most nearly corresponding to cotton, purified linters being taken as a standard, is obtained by recocking "easy bleaching" sulfite pulp with soda and bleaching with 2% bleach. The significant differences are found in the amts. of furfural-yielding constituents present and in the  $\alpha$ -cellulose content, which is not found in the linters. The recocked, raw cooked sulfite pulp bleached with 3% bleach does not differ so markedly from the above sample and represents a 6% higher yield on the basis of the original wood. It is probable that the yield of cellulose suitable for the manuf. of esters could be materially increased by giving a light or raw cooked stock a bleaching treatment prior to recocking with soda. Alk. cooking produces a larger amt. of  $\beta$ -cellulose than acid cooking, the amt. increasing with the severity of the cooking conditions. From a chem. standpoint pulps produced by alkali are less similar to cotton than those produced by acid cooking or by acid and

alk. cooking. On this basis the former appears to be less suitable for esterification. Cellulose from wood and that from cotton do not represent identical chemical aggregates and the same is true of wood celluloses obtained by acid and alk. cooking. The practice of checking wood cellulose according to the specifications for cotton is therefore a questionable procedure.

C. J. WEST

**The behavior of oxidized cellulose.** EDMUND KNECHT AND F. P. THOMPSON. *J. Soc. Dyers Colour.* 38, 132-6(1922).—Expts. show that in the initial stages of oxidation of cellulose by  $\text{KMnO}_4$  in cold acid soln. (cf. *C. A.* 16, 1871) the rise in Cu number (cf. *C. A.* 1, 1696; 15, 1222) is nearly proportional to the amt. of oxidant used up. After the use of a half atomic proportion of O, the rise in Cu number is very gradual. This indicates that during the initial stages of oxidation the action is mainly to produce or liberate aldehyde or ketone groups, with a consequent increase in Cu reducing value. As the Cu-reducing value does not increase proportionately as the oxidation proceeds, it indicates that the action was not a simple one of conversion of hydroxyl groups to aldehyde groups, but becomes more complicated. Aldehyde groups of sol. carbohydrates are readily oxidized to carboxylic acid groups, which have no Cu-reducing value. The soly. in NaOH soln. of the products obtained by drastic oxidation indicates their acidic character. Examn. of the ester reactions of the oxidized cellulose shows that this acidic character is not due to an increase in reactive hydroxyl groups. The acetylation of oxidized cellulose by  $(\text{CH}_3\text{CO})_2\text{O}$  and  $\text{ZnCl}_2$  does not give any indication of the effect of oxidation on the hydroxyl groups of cellulose. This is due to the great reduction in yield.  $(\text{CH}_3\text{CO})_2\text{O}$  has a much greater hydrolyzing action on oxycellulose than on cellulose itself. When nitrated under identical conditions oxidized cellulose gives products contg. less N than cellulose, and it is inferred that oxidation results in suppression of the hydroxyl activity. Owing to the strong reducing action of oxidized cellulose it was not possible to obtain a labile nitrate.

CHAS. E. MULLIN

**Chemical hydration of pulp.** ALFRED MacKAY. *Paper* 29, No. 16, 7-10(1921).—Properly controlled chem. hydration gives no reduction in good papermaking qualities with any grade of stock; it gives an increase in strength of the finished sheet, a decrease in beating time, a stock that will mix in all proportions with other stocks, better physical properties in the finished sheet, a stock that will reach a certain degree of slowness and result in a longer fiber with better felting qualities, with a reduction in caustic, time of digestion and amt. and time required for bleaching.

H. H. HARRISON

**Effect of bleaching on fibers.** F. SUTERMEISTER. *Paper Industry* 3, 1640-5 (1922); cf. *C. A.* 16, 491.—Data are given to prove that the more bleach fibers require the greater will be the wt. lost due to bleaching. This applies to pulps made in different mills and to pulps made in the same mill at different times. Expts. described show that for equal bleach consumption, soda or sulfate fiber loses less in wt. than sulfite does. The loss in wt. decreases with rising temp. When an excess of bleach is added to the pulp and the excess removed by washing at the end of a definite period higher temp. causes more loss in wt. because more bleach is used up. In permanganate bleaching the coloring matter is attacked very rapidly, the cellulose itself slowly. Bleaching increases the strength of sulfite fiber to a certain point after which it decreases; with soda fiber there is a decrease as bleaching proceeds. Exptl. results show that the injurious effect of oxycellulose has been much over-rated. At the end of two years sheets contg. oxycellulose were less yellow than those contg. none. The incomplete removal of dissolved org. matter causes bleached fiber to be yellower than if it were thoroughly washed.

H. H. HARRISON

**Use of clean water as a preservative for storing mechanical pulp.** R. J. BLAIR AND E. PARKER-CAMERON. *Paper Industry* 3, 1528; *Pulp & Paper Mag. Can.* 20, 64-7; *Paper Trade J.* 74, No. 9, 47-50(1922).—Ground wood pulp stored under water

shows slight deterioration in comparison with fresh pulp and is superior to the same pulp stored exposed to air. Running water is better than periodic change and lapped pulp keeps better than pressed or slush pulp. In cold storage little deterioration is noticed.

H. H. HARRISON

**Gas from strawboard factory waste waters.** A. HERMANN. *Hel. Gas* 40, 131-5 (1920).—A commission appointed by the Dutch Government recommends storage in settling tanks followed by irrigation treatment or filtration as the best and cheapest means of purifying the effluent from strawboard factories. In a pulp factory employing this process it has been found that in absence of air the effluent undergoes a fermentation due to rodlet bacteria which, at an optimum temp. of 35°, produce a gas contg. 23-30% of CO<sub>2</sub> and 70-77% of CH<sub>4</sub>. One vol. of effluent evolves 2 vols. of gas, which is collected in bell covers, conducted to a gas holder and employed for the production of elec. current for power and lighting in the factory, and the surplus is taken by the local gas works and mixed with coal gas in the proportion of 25%. An analysis of the gas showed CO<sub>2</sub> 24.7%, CH<sub>4</sub> 64.3%, other hydrocarbons 0.6%, H 4.9%, O 0.4%, N 5.1%; it contained traces of CS<sub>2</sub> but no H<sub>2</sub>S or CO.

J. S. C. I.

**A study of electrical insulating papers.** ANON. *J. Brit. Inst. Elec. Eng.* 60, 657-69 (1922); 11 illus.; also in abbreviated form in *Electrician* 89, 126-7 (1922).—A report of the Brit. Elec. Research Assoc. An extensive study of papers to be employed for insulation (other than in the construction of cables) has been carried out and after collaboration with the manufacturers a series of definitions and tests has been drawn up which are intended to avoid ambiguities and serve as a basis for the development of acceptance tests. The report is divided under the following headings: definitions, test recommended, chem. tests and uses for insulating papers. Among the chem. tests the one for the detection of metallic particles consists in immersing the paper in a soln. of K<sub>3</sub>Fe(CN)<sub>6</sub> after satn. in dil. HCl soln. Each Fe particle will produce a blue spot on the paper. The application of a 1% AgNO<sub>3</sub> soln. to the surface of the paper will produce a black spot on each metallic particle. The paper is dropped into a 1% soln. of CH<sub>3</sub>COOH and allowed to dry for one hr. lying flat on a cloth. The sample is then dropped into a soln. containing 1 cc. CH<sub>3</sub>COOH and 1 g. of K<sub>3</sub>Fe(CN)<sub>6</sub> per l. of H<sub>2</sub>O. The Fe particles will appear as blue spots and the Cu, brass and gunmetal as red spots.

C. G. F.

**Strength and resistance of paper. Breaking length.** E. ARNOULD. *Papier* 25, 209-12 (1922).—A discussion of the factors affecting the strength of paper, of the precautions to be taken in testing tensile strength by the Schooper tester, and of the strength tests to be applied to various grades of paper.

A. P.-C.

**The utilization of jack-pine in the manufacture of newsprint.** MAURICE NEILSON. *Pulp & Paper Mag. Can.* 20, 61-63; *Paper Industry* 3, 1510-3; *Paper Trade J.* 74, No. 7, 45-7; *Paper* 29, No. 24, 7-10 (1922).—During 12 days the Belgian Industrial Co. Ltd. used jack-pine sulfite pulp for newsprint. Nine hrs. cooking was found sufficient and fair yields of pulp were obtained. Paper machine data show that jack-pine runs normally on the paper machine. Short and floury ground wood stock is accountable for much of the so-called "pitch" difficulties.

H. H. HARRISON

**The origin of so-called "mildew" injury to paper makers' felt.** JEAN MACINNERS. *Paper Trade J.* 74, No. 14, 41 (1922).—An organism similar to *Bacillus mesentericus* is the cause of the "mildew" spots. Spores of this are nearly always present in wool; moisture and a temp. of 50° F. to 98° F. favor its growth.

H. H. HARRISON

**The determination of sizing quality.** F. T. CARSON. *Paper Trade J.* 74, No. 14, 43-49; *Paper Makers' Mo. J.* 60, 165-7 (1922).—A resumé of test methods in common use is given and a new test proposed. A sample of definite area is cut, heated in an oven at 105° until all moisture is expelled and then weighed in a weighing bottle. The

fluid is calcd. using the thickness of the paper satd. with water. When the ash content does not exceed 3 or 4% the fluid vol. may be detd. with sufficient accuracy by subtracting two-thirds its bone-dry wt. in g. from its total in cc. The paper sample is placed upon distd. water or ink and the number of seconds required for max. curling are detd. The square root of the time of curl divided by the percent fluid vol. multiplied by the mean value of the thickness of the satd. sample is a measure of the relative size-fastness of the paper tested.

H. H. HARRISON

Further investigations and observations on the value of the ammoniacal copper oxide method for the valuation of feeding stuffs (MACH) 12.

MAGNUS, H.: *Theory and Practice of Cellulose Hydrolysis*. Berlin: Paul Parey. 4 pp.

**Cellulose.** H. P. WAENTIG and J. O. W. GIERISCH. Brit. 178,196, Jan. 10, 1921. In the prepn. of cellulose capable of forming highly viscous solns.; the lignin substances are converted by treatment with Cl into a form sol. in cold dil. soda lye, while the cellulose remains unaltered. Straw is first boiled with dil. HCl such as is obtained from the chlorination process. Wood is first boiled with NaOH or milk of lime, and may be treated as shavings with Cl dild. with an indifferent gas or applied alternately with such gas. In treating wood as chips, Cl under pressure is used. The HCl produced by the chlorination reaction may be re-converted into an impure Cl and used again.

**Cellulose manufacture.** ZELLSTOFFFABRIK WALDHOF, H. CLEMM AND A. SCHNEIDER. Brit. 178,106, April 1, 1922. The waste heat of gas, steam, or vapor generated in cellulose factories is utilized to heat fresh sulfite lye. The lye is circulated in a closed circuit under pressure, and loss of sulfurous acid is thus avoided.

**Molded articles of pure cellulose.** M. G. OLIVIER. U. S. 1,422,469, July 11. A moistened sheet of pure cellulose is applied to a metal core and heated to dry it and expand the core which is then rapidly cooled to effect shrinkage of the core and enable it to be readily withdrawn from the cellulose article.

**Nitrocellulose, etc.; lacquers.** A. W. PHILLIPS. Brit. 177,536, March 23, 1922. By heating cellulose esters or products contg. them, more particularly nitrocelluloses or their doughs or solns., smokeless powders, celluloids, or nitrocellulose films or coatings such as imitation leather, the viscosity of the doughs or solns. prepd. from the products is permanently lowered; e. g., from smokeless powder a soln. is obtained suitable for use in a lacquer or "spray." The products may be heated in the dry state, or in non-solvent liquids, or in soln., or by a combination of these methods; and the extent to which the viscosity is reduced depends on the temp. and the duration of the heating, the reduction being greater as the temp. is higher. In examples, smokeless powder is heated in an autoclave with H<sub>2</sub>O or other non-solvent liquid to temps. of 100-140° or higher; a dough or jelly formed by dissolving smokeless powder in a mixt. of AcOEt and benzene is heated in an autoclave to 107°, being converted into a mobile liquid of the consistency of molasses; alternatively, solvents, such as acetone-alc. or camphor-alc., may be employed; nitrocellulose or a nitrocellulose product is heated in air, or preferably in an indifferent gas, to 120° or 130°.

**Cellulose ethers.** L. LILIENFELD. Brit. 177,810, April 1, 1922. Stable cellulose derivs. that contain alkyl or aralkyl groups and are insol. in H<sub>2</sub>O and the usual org. solvents, but are sol. in alkali solns., are prepd. by heating cellulose or a deriv. of cellulose in the presence of alkylating or aralkylating agents with such a quantity of caustic alkali as is not sufficient of itself under the conditions obtaining to convert the cellulose

into an alkali-sol. conversion product. Suitable parent materials are cellulose, or an alkali-sol. deriv. such as a xanthate. The parent material, if alkali insol., is impregnated with the alkali soln., or mixed with solid alkali, preferably powdered, either alone or together with a satd. soln. of the alkali; and the mixt., preferably comminuted, is warmed or heated with an alkyl or aralkyl ester of an inorg. acid. Alternatively, the cellulose, etc., may be warmed with the alkali soln. and then heated with the alkylating agent. If an alkali-sol. cellulose deriv. is selected, then it is appropriate to work in soln. throughout. Generally for each mol. of cellulose not more than 3 mols. will be used, although normally two mols. will be adequate if cellulose is employed, and 1.5 mols. if a cellulose deriv. is selected. However, the new cellulose derivs. are formed in the presence of much larger amts. of alkali and alkylating agent, provided that the concn. of the alkali is less than 25%. The derivs., if insol. in the reaction mixts., are washed with  $H_2O$ , acid, alc., alcohol-ether, and then dried, or alternatively, while still moist, dissolved in alkali soln.; if the reaction mixt. is a viscous soln. it may be employed as such, or the cellulose derivs. may be isolated by pptn. with  $H_2O$  or acid, and subsequent treatment as in the first case. The new cellulose derivs. are pptd. from their alk. solns. by the pptg. media usually employed with viscose; from their solns. in strong mineral acids they are pptd. by  $H_2O$ , alc., glacial  $HOAc$ , and acetone. They may be used for the manuf. of films, artificial threads, plastic masses, paints, finishes, filling materials, sizing or binding agents, adhesives, thickening materials, fixing media for pigments in textile printing, and as coatings and layers. In working up the materials into these products there may be added before the final pptn. softening, etc., agents such as oils, fats, glycerol, sugar, soaps, and turkey red oil or its substitutes.

**Waterproof paper.** JYŌTARŌ KIMOTO, TETSURŌ ASANO and FUDEJIRŌ HAYASHI. Japn. 39,703, Aug. 30, 1921. A soln. obtained by filtering the boiled and crushed soy bean is mixed with a small quantity of tannic acid, about 5% powdered pine root and 10–20% pulp. Paper is painted with the soln., and with  $CS_2$  soln. of viscose. When dried, it is treated with dil.  $HCl$ . The product is waterproof and elastic.

**Apparatus for preparing paper-stock.** L. B. DECKER. U. S. 1,423,555, July 25. The app. is arranged to regulate automatically the consistency and percentage of ground wood and sulfite stock used in the manuf. of paper.

**Disintegrating paper stock by impinging streams.** M. C. J. BILLINGHAM. U. S. 1,422,251, July 11.

**Loading paper pulp.** F. REICHARD. Brit. 177,137, Nov. 24, 1921. The mineral salts, such as  $BaSO_4$ , used as filling for paper pulp, are maintained in suspension by the addition of water glass.  $MgCl_2$  soln. or other salts, or acids, which ppt. the  $SiO_2$ , may be used. Where mineral carbonates are used, their conversion into other salts is preferred.

**Resin size.** J. A. DE CEW and R. J. MARX. Brit. 176,995, Feb. 2, 1921. In the manuf. of dil. solns. of resin size for use in paper making, hot resin soap contg. a considerable proportion of free resin is violently agitated with hot  $H_2O$  at a temp. above  $175^\circ F$ . in the proportion of approx. 12 parts of  $H_2O$  to one of dry size, and the soln. thus produced is then further dild. with cold  $H_2O$ . Limiting proportions for the first stage of the dildn. are one part of size, contg. originally 40% of  $H_2O$ , to a max. of 12 parts of hot  $H_2O$  or a min. of 5 parts of hot  $H_2O$ . Cf. 23,896, 1902 and 2142, 1915 (C. A. 10, 2049).

**Viscose.** W. P. DREAPER. Brit. 178,152, Nov. 8, 1920. In the prepn. of viscose the caustic alkali soln. is cooled to a temp. not exceeding  $5^\circ$ , e. g., to  $-2^\circ$ , before addition to the cellulose material. To assist the penetration of the caustic alkali soln. into the cellulose, the air in the vessel in which the treatment is carried out may be evacuated or may be replaced by a gas that is sol. in or reacts chemically with the alkali soln., such as  $NH_3$  gas or  $SO_2$ . Cf. C. A. 16, 2780.



**Artificial filaments; films.** BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD., C. W. PALMER AND W. A. DICKIE. Brit. 177,268, Jan. 4, 1921. Artificial filaments or films are prep'd. from cellulose acetate solns. in particular the solns. in acetone, by coagulating the formed filament or film in a bath contg. a thiocyanate. By this process the filament, etc., is of improved strength and elasticity, and granulation is obviated, and in the case of filaments it is possible to employ large spinning orifices and to draw out the filaments to the fineness of natural silk. Plastifying agents such as benzyl alcohol, and other additions may be made to the cellulose acetate soln.

**Artificial threads; films; viscose.** SNIA SOC. DI NAVIGAZIONE INDUSTRIA E COMMERCIO REPARTO VISCOSA. Brit. 178,121, April 6, 1922. Threads, ribbons, films, etc., from viscose are obtained of improved quality by the employment of coagulating baths in which the org. by-products formed during the coagulating process have accumulated. The baths are withdrawn from the app., are conc'd. and cooled to sep. out mineral salts such as Na sulfate or formate, and are then returned to the app.

**Fiber board from chip waste.** M. CHEW. U. S. 1,423,081, July 18. Chip waste is cooked, shredded, pressed, dried and waterproofed. U. S. 1,423,082 and 1,423,083 relate to an app. and method for prepg. fiber board of this character.

**Fiber boards.** M. CHEW. Brit. 178,155, Nov. 12, 1920. Chip waste is steamed, mixed with  $H_2O$ , beaten in a ball mill or other beater to a fibrous, watery, pulpy mass, the fibers of which are unbroken but shredded, and then formed into a board and waterproofed. A binder such as talc, alone or mixed with ground asbestos or soda ash, may be used, and hair or the like may also be added. The dried board is waterproofed by means of a mixt. of  $Ca(OAc)_2$  and  $Al_2(SO_4)_3$ .

**Chlorination of cellulose lyes.** A. SCHMIDT. Brit. 178,104, March 31, 1922. Sulfite cellulose lyes, after sepn. of sugar and concn., are chlorinated by passing a current of Cl through, filtering, and treating with a chlorate and HCl. Sol. reddish yellow products of acid character are obtained which are useful as *laning materials* and as *resin substitutes*.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Dyestuff testing.** I. L. G. HAYES. *Color Trade J.* 10, 35-8(1923).—Lab. equipment and methods of dyeing direct, developed, sulfur and basic dyes. II. *Ibid* 80-3.—Methods of dyeing union, acid and chrome dyes, and the procedure for testing fastness. CHAS. E. MULLIN

**Electrometric titration as a means of determining the free sodium sulfide in a sulfur black dye bath.** W. W. RUSSELL AND S. T. ARNOLD. *Am. Dyestuff Rep.* 10, 346, 375-6, 451-2(1922).—It is necessary to det. the  $Na_2S$  content of a standing S dyebath in order that the dyestuff which has ppt'd. on standing may be again brought into soln. and the bath be made ready for dyeing by the addition of a suitable amt. of  $Na_2S$ . The electrometric method avoids the necessity of pptg. the dye or of distg. the  $H_2S$  from the  $Na_2S$  (cf. Len, C. A. 8, 3367 and Swann, C. A. 11, 2545). The app. used was essentially that described by Roberts (cf. C. A. 13, 2302), which with the material at hand in a com. lab. can be built at a cost of \$30 for the new material needed. Iodine, which was used as an oxidizing agent, has the disadvantage that it must be used either in acid or in neutral soln., and acid results in the pptn. of the dye and liberation of  $H_2S$ . To eliminate or control this side reaction is the main problem of this study. Trial showed that the freshly reduced dye was so sensitive to the oxidizing action of the air, that operations involving exposure to the air must be avoided. It was decided to con-

trol rather than to try to eliminate the oxidation of the pptd. dye by allowing the I to act only for a given time, and then adding an excess of the standard  $\text{Na}_2\text{S}_2\text{O}_4$ , the idea being that sufficient time be given for the I to react with the free sulfide present but not enough allowed for the I to attack the dyestuff to any appreciable extent. A sufficient amt. of the dye bath for a series of tests should be obtained in a stoppered bottle from which smaller samples can be taken. To each of 2 beakers contg. about 700 cc. of water and 10 cc. of 1 to 3 HCl about 70 cc. of 0.1 *N* iodine are added from a 100-cc. buret (I in excess of the amt. required by the sulfide must be added here) and well mixed. Two 50-cc. pipets, each topped with a short piece of rubber tubing contg. a solid glass bead, are used to remove the samples. By this arrangement the pipets can stand full of liquid, which should be drawn well above the mark. The pipet first filled is drawn down to the mark and the tip at once immersed in its respective I soln. The same procedure is carried out with the second pipet. The tip of the first pipet is kept well under the surface of the soln. as the dyebath sample is released and the whole well stirred. The pipet is rinsed into the soln. and 25 cc. of 0.1 *N* thiosulfate (an excess over the free I present) is added after the I has reacted 1 min. The same operations are carried out with the second pipet. The samples are now ready for back titration with I, the dyestuff being present as a suspended ppt. which soon settles. The beaker contg. one of the samples is placed in the electrometric app. with the 2 electrodes dipping into the soln. and I is added as rapidly as feasible; the largest permanent deflection of the galvanometer needle is taken as the end point. In case of running by the end point a few drops of thiosulfate are added and the end point is again located by adding I drop by drop. The method is accurate to within 0.5% of the actual amt. of free  $\text{Na}_2\text{S}$ . •

L. W. RIGGS

Chronological list of important substantive dyes. ANON. *Color Trade J.* 10, 129-32(1922).—Cf. *C. A.* 16, 1321.

CHAS. E. MULLIN

Chronological list of mordant dyestuffs. ANON. *Color Trade J.* 10, 155-7(1922).

CHAS. E. MULLIN

Chronological list of sulfur dyes. ANON. *Color Trade J.* 10, 226-8(1922).

CHAS. E. MULLIN

Naphthol AS, its properties and application to dyeing and color printing. I. JOSEPH R. MINEVITCH. *Color Trade J.* 10, 18-21(1922).—The manuf. of naphthol AS and its use in dyeing and printing. II. *Ibid* 74-6.—Diazotization of the base and yarn dyeing. III. *Ibid* 132-3.—Directions for meta-red. Cf. Rowe and Levin, *C. A.* 16, 2413.

CHAS. E. MULLIN

Notes on the manufacture of methylene blues. I. RAFFAELLE SANSONE. *Color Trade J.* 9, 237-40(1922).—The method and app. used in the manuf. of methylene blue B from MeOH and  $\text{C}_6\text{H}_5\text{NH}_2$  are described. II. *Ibid* 10, 6-10(1922).—Improvements in plant app. and operation for the manuf. of methylene blue B are suggested and chem. control methods are discussed.

CHAS. E. MULLIN

Uses of *p*-toluenesulfonyl chloride in the manufacture of dyes and intermediates. JULES BERRI. *Color Trade J.* 11, 7-8(1922).—Anhyd.  $p\text{-CH}_3\text{C}_6\text{H}_4\text{SO}_2\text{Cl}$  can be used as a condensing agent where  $\text{H}_2\text{O}$  is to be removed and is less destructive to org. matter than  $\text{H}_2\text{SO}_4$ . The reaction with primary amines can be used to protect the amino group in subsequent nitration. A number of references to patents covering its use in the manuf. of intermediates, dyes, lakes, etc., are given.

CHAS. E. MULLIN

The chemistry of intermediates. M. L. CROSSLEY. *J. Ind. Eng. Chem.* 14, 802-5(1922).—A review.

E. J. C.

The manufacture of *p*-aminophenol base and the hydrochloride. H. M. GENSEL. *Color Trade J.* 10, 10-1(1922).—A general description of the manuf. from  $p\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$ , Fe and HCl.

CHAS. E. MULLIN

**Dyestuffs suitable for silk goods.** EMILE CAGLIOSTRO. *Color Trade J.* 10, 45-7 (1922).—A general article covering the properties of the various classes of dyes when applied to silk. CHAS. E. MULLIN

**Zinc dust, its uses in the manufacture and application of dyestuffs.** I. J. M. MATTHEWS. *Color Trade J.* 10, 14-6 (1922).—Manuf. of Zn dust and its use in the manuf. of intermediates. II. *Ibid* 58-61.—Its use in the manuf. of hyposulfite compds. and in indigo dyeing. III. *Ibid* 112-3.—Stripping and printing. IV. *Ibid* 144-5.—Analysis of Zn dust. CHAS. E. MULLIN

**Use of zinc dust in colored discharge printing.** J. M. MATTHEWS. *Color Trade J.* 11, 9 (1922).—Formulas are given. CHAS. E. MULLIN

**Use of zinc dust in white discharge printing.** J. M. MATTHEWS. *Color Trade J.* 10, 252 (1922).—Formulas are given. CHAS. E. MULLIN

**Testing zinc dust for textile purposes.** J. M. MATTHEWS. *Color Trade J.* 10, 220 (1922).—To det. the reducing action of Zn dust mix 0.5 g. dust with 50 cc.  $K_2Cr_2O_7$  (40 g. per l.) soln. and 5 cc.  $H_2SO_4$  (1 : 3). Add 5 cc. more  $H_2SO_4$  soln. and stir until the Zn is dissolved. Add 100 cc.  $H_2O$ , 10 cc. concd.  $H_2SO_4$  and 25 cc.  $FeSO_4$  soln. (200 g. in 1 l. 10%  $H_2SO_4$ ). Mix well and slowly add the  $FeSO_4$  soln. from a buret until a blue color develops on the spot plate with  $K_3Fe(CN)_6$ . This gives the excess  $K_2Cr_2O_7$  soln. used and each cc.  $K_2Cr_2O_7$  used corresponds to  $0.04 \times 0.6666$  g. reducing metals present. CHAS. E. MULLIN

**Dyeing of fast chrome colors.** L. G. HAYES. *Color Trade J.* 10, 253-8 (1922).—The dyeing and fastness properties of 50 chrome dyestuffs are discussed. C. E. M.

**Printed effects.** RAFFAELE SANSONE. *Textile World* 62, 579 (1922).—Formulas are given for printing black, blue and red on white or light colored ground. C. E. M.

**Defects found in piece-dyed serges and some methods of overcoming same.** G. W. HORNE. *Textile Colorist* 44, 431-3 (1922).—Shaded, listed, cloudy, streaked and wrinkled pieces are discussed. CHAS. E. MULLIN

**Various aspects of bleaching.** S. J. PENTECOST, et al. *J. Soc. Dyers Colour.* 38, 142-3 (1922).—The lime boil on cotton is being displaced by NaOH, sometimes with the addn. of  $Na_2CO_3$  and soap. All mineral oils and metal particles must be removed, and partial mercerization should be avoided on goods to be dyed. For wool the  $H_2O_2$  bleach costs more than stoving and gives a more permanent, purer but not as brilliant a white. A slight stoving after the  $H_2O_2$  bleach is recommended.  $KMnO_4$  is best for unions, usually 0.6%  $KMnO_4$  with 0.56%  $H_2SO_4$  gives good results. Cotton only requires 0.2%  $KMnO_4$  and equiv. acid when boiled out under pressure. CHAS. E. MULLIN

**Science in the textile industry.** E. D. WALEN. *J. Ind. Eng. Chem.* 14, 806-7 (1922). E. J. C.

**Department of Commerce, Bureau of Standards, Washington, D. C. ANON. Textile Colorist** 44, 440-2 (1922).—A description of the equipment and work of the Textile Section of the Bureau of Standards. CHAS. E. MULLIN

**Electrolytic waterproofing of textile fabrics: the Tate process.** H. J. M. CRRIGHRON. *J. Franklin Inst.* 192, 497-510 (1921).—Woolens are thoroughly washed with soap and rinsed in water at a temp. of approx.  $150^\circ F$ . Cottons are destarched and freed from foreign matter. The fibers are thereby cleansed, and their capillary pores opened for subsequent refilling with water-repelling substances. The fabric is next satd. with an attenuated soln. of Na oleate, it then passes between a graphite cathode, over which flows a soln. of Al acetate, and an Al anode which is completely enveloped in a heavy woolen pad. This pad is an important and distinctive feature of the process; before its introduction, the waterproofing was quite irregular. Insol. basic Al oleate is formed and deposited on the fabric, which is washed in running water, passed between squeeze rollers and through a second Na oleate bath, then between another set of elec-

trodes, whose position is the reverse of that of the first set. Two treatments with 1 reversal suffice for silk and woolen goods; 4 treatments with alternately reversed action are essential for cotton goods. Finally the fabric is washed, and dried by passing between a series of steam-heated drums. Two distinct electrochem. reactions occur: (1) the formation at the anode of  $\text{Al}(\text{OH})_3$  which is apparently carried by cataphoresis into the capillaries of the fabric, (2) the deposition on the fabric, probably only on its surface, of a film of basic Al oleate, formed by the action of the  $\text{Al}(\text{OH})_3$  from the anode on the normal Al oleate which results from the reaction of the Al acetate flowing over the cathode with the Na oleate in the fabric. The treatment renders the goods waterproof and mildew-proof, shrinks them, and increases their strength. For cuts and full description of the machinery, and tests on the product, reference must be made to the original paper.

JOSEPH S. HEPBURN

The manufacture of waterproof linen fabrics. J. SCHMIDT. *Color Trade J.* 11, 34-6(1922).—General instructions and formulas are given for waterproofing by means of Al and Ca soaps, and Al-ozokerite compd.

CHAS. E. MULLIN

Chlorination of wool. S. R. TROTMAN. *J. Soc. Chem. Ind.* 41, 219-24T(1922).—Properly chlorinated wool shows no loss in either tensile strength or elasticity. Improperly chlorinated wool shows decreases in these properties, different elec. properties, increased affinities for dyes and it is more readily wetted down. Treatment with a 2% soln. of  $\text{HCHO}$  before chlorination decreases the soly. and the loss of wt. Methods of chem. and microscopic examn. and the detn. of loss in wt. are described. The addn. of mineral acids to bleaching powder soln. leads to the liberation of both  $\text{HClO}$  and  $\text{Cl}$ , the proportions depending upon the amounts of acid used. Weaker acids such as  $\text{AcOH}$  and boric acid cause the liberation of mostly  $\text{HClO}$ . Expts. show that damage during chlorination is due to destruction of cortical cells and the complete disappearance of epithelial scales by  $\text{Cl}$ . Damage may also be produced during finishing and after finishing, owing to incomplete removal of  $\text{Cl}$ , with the consequent breaking down of damaged fibers. Since  $\text{Cl}$  damages wool more easily than  $\text{HClO}$ , bleaching powder should be used under conditions producing a min. liberation of  $\text{Cl}$ . Different grades of wool require different treatment and the max. bleaching soln. applicable to a particular grade should be detd. and never exceeded. The strength of bleaching powder when used with mineral acid should rarely exceed 0.6 g. of available  $\text{Cl}$  per l. With boric acid considerably stronger solns. may be used.

W. H. BOYNTON

Sorption of neutral soap by wool, and its bearing on scouring and milling processes. ANON. *J. Textile Inst.* 13, 127-42(1922); cf. following abstract.—The word sorption is used in a non-committal sense to denote the removal of a component from a soln. irrespective of the precise mode of action, whether chem. or phys. in the first place and, if physical, whether the substance effecting this removal takes the component into its interior (absorbs it) or accumulates it on its surface (adsorbs it). The method adopted consists in placing the wool in the soap soln. for a definite time at const. temp., and then withdrawing a sample of the liquor and detg. its alkali and fatty acid content. The portion sorbed is thus obtained by difference. The original vol. of the soln. in liters multiplied by the diminution of alkali or soap in g. per liter gives the quantity sorbed. This rule is not strictly correct but was used in this study and a rough correction applied by making an assumption based on our knowledge of the amt. of water sorbed by wool. The exptl. details are carefully stated and the results are shown in 6 tables and 5 charts of graphs. The following summary omits many practical points on the scouring and milling of wool, which are brought out in the original paper: (1) The basic portion of the soap is sorbed much more than the acid portion so that the soln. becomes charged with excess of fatty acid. (2) The loss of fatty acid by the soln. appears to take place in 2 ways (a) by sorption of actual soap, (b) by the pptn. on the wool fiber

of some of the freed fatty acid present as the result of the preferential sorption of NaOH. (3) In case of dil. solns., this pptn. is the main cause of the loss of the fatty acid by the soln. (4) The diminution of this pptn. with increase of concn. of the soln. is due to the "protective colloid" action of the soap, and with strong solns. the main cause of the loss of fatty acid is therefore sorption of actual soap. (5) The process of sorption proceeds for several hrs. without sign of equil., and is greatly accelerated by rise of temp. (6) During the initial stages of the contact between the wool and soln. the rate of loss of alkali is very much greater than the rate of loss of fatty acid, but this difference lessens with time, and, after prolonged contact, the 2 rates appear to become roughly equal. (7) This mode of variation between the 2 rates of loss is to be expected *a priori* whether it is assumed that the loss of fatty acid is due to pptn. of fatty acid as a secondary action following the sorption of alkali, or to the sorption of actual soap. (8) With mixts. of soaps from oleic and palmitic acids, there is a preferential sorption of the oleic acid. (9) K and Na oleates do not differ in any marked manner with respect to the sorption of either alkali or fatty acid. (10) The sorption of alkali from a chem. neutral soap soln. is equal to that from a soln. of caustic alkali of very much smaller concn. This suggests a method of measuring the "effective alkalinity" of chem. neutral soaps and other salts, such as  $\text{Na}_2\text{CO}_3$  and  $\text{Na}_2\text{B}_4\text{O}_7$ , which are alk. in aq. soln. (11) The ratio of the concn. of caustic alkali to that of the soln. of soap giving the same alkali sorption decreases with the increase of concn. of soap. (This is to be expected on the theory of hydrolytic dissociation.) (12) The known advantage of free alkali (carbonate) has been attributed by previous workers to its phys. action in increasing emulsification, but it is obvious that in the case of wool scouring it has an important chem. function in opposing the liberation of fatty acid.

E. W. RIGGS

**Standard method for the estimation of soap in wool.** ANON. *J. Textile Inst.* 13, 143-9(1922); cf. preceding abstract.—Residual soap left in wool by insufficient washing frequently causes trouble in dyeing and finishing. The absorption of alkali from soap by wool fiber and the action of  $\text{CO}_2$  of the air on the soap results in the formation of  $\text{Na}_2\text{CO}_3$  or  $\text{K}_2\text{CO}_3$ , and an acid soap or in some cases a free fatty acid is left on the fiber. In the method used 26 g. of 9-oz. worsted cloth or 10 g. worsted sliver or top were extd. in a 200-cc. Soxhlet extractor with neutral redistd. abs. alc. All operations must take place in glass vessels without corks. The extn. was kept near the b. p. by covering the extractor with asbestos paper. For ordinary analysis 12 siphonings requiring 5 to 6 hrs. are sufficient. The ext. is filtered, the alc. distd. off down to about 50 cc., evapd. to dryness on the water bath, dried in the steam oven, cooled in a desiccator under diminished pressure and weighed until constant. This gives the total alc. ext. It is boiled with 60 cc. water, Me orange or Me red is added and a known excess of 0.1 N  $\text{H}_2\text{SO}_4$  (25 to 30 cc.) is then run in, boiled, cooled and shaken out with neutral  $\text{Et}_2\text{O}$  3 times. The  $\text{Et}_2\text{O}$  after extn. is washed with water and the washings are added to the aq. acid liquid. On evapn. the ether ext. gives the total oil and fatty acid in the alc. ext. The oil thus obtained is dissolved in abs. alc. and titrated with 0.1 N KOH or with NaOH phenolphthalein indicator. The result is calcd. to fatty acid or olein present as such. The residual liquor after shaking with  $\text{Et}_2\text{O}$  is titrated back with 0.1 N KOH and the difference between the added acid and back titration is calcd. to Na oleate. After back titration the liquid is evapd. to dryness, washed with  $\text{Et}_2\text{O}$  and dissolved in  $\text{H}_2\text{O}$ .  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$  and  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  are added to remove Ca which is estd. with 0.1 N permanganate and calcd. to Ca oleate (or Na oleate). If an emulsion forms when shaking out with  $\text{Et}_2\text{O}$ , sep. the  $\text{Et}_2\text{O}$  as much as possible, evap. the acid liquor to dryness and wash the residue with  $\text{Et}_2\text{O}$  to remove the oil or fatty acid. These methods were checked by trial on cloth extd. free of soap after which a known amt. of soap was added, also on cloth not extd. and a known amt. of soap added, and it was found that

there was always a loss in alkali but that the fatty acid was recovered within the limits of exptl. error. Alkali is removed from the soap and retained in the wool in a form resistant to alc. extn., possibly in loose combination. When an unknown sample of cloth is submitted for analysis, it must first be extd. with freshly distd. petroleum ether to remove oil as such. This oil should be examd. for soaps by boiling in water and titrating with 0.1 N HCl. The cloth is afterwards extd. with abs. alc. as already described. Dyed material sometimes yields color to interfere with the titration. Such cases may generally be handled by suitable diln. and addition of a slight excess of indicator.

L. W. RIGGS

**Action of chloropicrin on the cocoon of *Bombyx mori*.** TSUNAO WATANABE. *J. Sci. Agr. Soc. (Japan)* No. 234, 177-188(1922).—The chrysalis in the cocoon (72 l.), the maggot and noxious insect accompanying it are killed with 1.5-2 lb. chloropicrin in a closed vessel. The chrysalis thus obtained is blacker than that killed by steam, which is attributed to the formation of blackish brown substances by the decompn. of the animal body by enzyme. Glycogen and proteins in the animal body are decomposed by an enzyme after death. The silk obtained from the cocoon treated with chloropicrin is coarse and slightly darkened in color compared with that obtained by steam treatment. This can be remedied by using Na phosphate and other treatment. In other properties and after treatment their is almost no difference by the 2 methods.

K. K.

**Manila hemp.** ANON. *Cordage World* Nov. 1921, 41; *Bull. Imp. Inst.* 20, 101(1922).—The % of ash varies with the grade of the fiber in such a way as to render the detn. of the ash an approx. accurate method for ascertaining the grade. The percentages of ash yielded by the various govt. grades of Manila hemp are as follows: A. Extra Prime, 1.14; B. Prime, 0.62; C. Superior Current, 0.99; D. Good Current, 1.33; E. Midway, 0.81; F. Current, 1.93; S1. Streaky No. 1, 1.62; S2. Streaky No. 2, 2.15; S3 Streaky No. 3, 1.31; G. Seconds, 2.03; H. Brown, 2.32; I. Good Fair, 2.46; J. Fair, 3.00; K. Medium, 4.10; L. Coarse, 4.56; M. Coarse Brown, 3.36; DM. Dæet Coarse Brown, 2.76.

A. P.-C.

**A new protective agent for animal fibers.** ALFRED EDGE. *J. Soc. Dyers Colour.* 38, 136-9; *Am. Dyestuff Rep.* 11, 52-4(1922).—Protectol A. G. F. A., Nos. 1 and 2, apparently act as protective colloids upon animal fibers in alk. solns. They are neutral sirupy liquids of 1.31 and 1.24 sp. gr., resp., and sol. in H<sub>2</sub>O. No. 1 is pptd. by alkali carbonates and is used with caustics. No. 2 is used with alkali carbonates and sulfides. They are recommended for use in alk. solns. for the following cases: wool scouring; alk. stripping; vat dyeing wool; union, silk, leather and speck dyeing with sulfide dyes; chrome dyeing; degumming silk with alkalis; "killing" solns. for furs and in dyeing with Urosl dyes; in depilatory solns., and in feather dyeing. No data are given regarding the constitution of Protectol.

CHAS. E. MULLIN

**A department store laboratory.** E. B. MILLARD. *J. Ind. Eng. Chem.* 14, 785-6 (1922).—Activities are interestingly discussed. A "wearing machine" for textiles is described.

E. J. C.

The manufacture and applications of peroxide of hydrogen (WILSON) 18. Disposal and purification of flax-retting effluents (GAUGE) 14. Analysis of sodium hyposulfite (HARMIST) 7. Optically active dyes (SINGH, *et al.*) 10. Dyes derived from camphoric anhydride (SRICAR, DUTT) 10.

AUSTIN, WM. E.: Principles and Practice of Fur Dressing and Fur Dyeing. New

York: D. Van Nostrand Co. 184 pp. \$4. Reviewed in *Am. Dyestuff Rept.* 11, No. 2, 56(1922).

CLARKE, A.: *Coal Tar Colours in the Decorative Industries*. London: Constable & Co. 166 pp. 6s. Reviewed in *Chem. News* 124, 385(1922) and *Chem. Trade J.* 70, 727(1922).

GLAFEY, HUGO: *Rohstoffe der Textilindustrie*. 2nd Ed. revized. Leipzig: Quelle & Meyer. M 12. 202 pp. Reviewed in *Faserforschung* 1, 145(1922).

**Triazo dyes.** H. JORDAN. U. S. 1,422,866, July 18. 1,4-Diaminonaphthalene-6-sulfonic acid, 1-aminonaphthalene-6-sulfonic acid,  $\beta$ -naphthol and resorcinol form a triazo dye which gives a greenish blue soln. in  $H_2O$  and dyes cotton greenish blue shades which are rendered fast to washing by after-treatment with  $CH_3O$ . 2,7-Dihydroxynaphthalene may be used instead of  $\beta$ -naphthol and 1,4-diaminonaphthalene-7-sulfonic acid can be substituted for the 1,4-diaminonaphthalene-6-sulfonic acid, with production of similar dyes.

**Dye preparations.** A. GLOVER and G. MARTIN. Brit. 178,179, Jan. 6, 1921. Tablet dyes are made by mixing dry a dye, binding agent, *e. g.*, dextrin, and a hydrated salt, such as Glauber's salt, capable of giving up its water of crystn. under pressure. The mixt. is subjected to pressure, *e. g.*,  $1/2$  ton per sq. in., whereupon it assumes a pasty condition and sets when the pressure is released.

**Dyes.** L. CASSELLA & Co. Brit. 176,833, Oct. 14, 1920. Addition to 151,000 (C. A. 15, 601). The dyes described in the principal patent are obtained by condensing  $\beta$ -naphthoquinone, or a substitution product thereof, with a sulfurized alylamine having the S-contg. group in the *o*-position to the amino group, of one of the following classes: (1) *o*-aminoarylmercaptans, (2) *o*-aminoarylthiosulfonic acids, (3) *o*-aminoaryl-disulfides, (4) the products (described in 17,417, 1914 (C. A. 16, 500)) of interaction of disulfur dichloride with aromatic amino compds., and the derivs. thereof obtained by treatment with  $H_2O$  and alkali; sulfurized arylamines contg. a mono- or dialkylamino group in the *p*-position to the primary amino group are excluded. The products are acid mordant dyes if they contain acid groups but vat dyes if free from such groups. Numerous examples are given.

**Dye preparations.** FARBWERKE VORM MEISTER, LUCIUS & BRUNING. Brit. 177,526, March 21, 1922. Addition to 171,078 (C. A. 16, 1015). The stable dry vat preps. of the principal patent, obtained by evapg. mixts. of alkali indigo white with quinone vat dyes with or without agglutinants, are modified by substituting compds. for the indigo whites. Examples are given of mixts. contg. bromoindigo white, NaOH, hyposulfite, molasses, and one of the quinone vat dyes of 19,599, 1912, 22,528 (C. A. 9, 865), 3682, 1914, or a dye from quinone and *p*-chloroaniline. Instead of bromoindigo, chloroindigo or dibromoindigo may be used.

**Printing silk and cotton.** CALICO PRINTERS' ASSOCIATION, LTD. and G. NELSON. Brit. 177,926, Feb. 3, 1921. A process for printing cotton and silk fabrics consists in (1) mordanting the fabric with a Cr mordant, (2) dyeing with dyes appropriate to the mordant and known to be affected by reducing agents, (3) printing with discharge colors comprizing hyposulfites as reducing agent and a salt or salts of citric or tartaric acid for producing a white discharge and in addition a vat, S, or other dye for a colored discharge, and (4) after-treating the fabric by ageing, soaping, etc.

**Bleaching fabrics, etc.** J. HODSON. Brit. 176,869, Dec. 11, 1920. In the white bleaching and color bleaching of textile fabrics and materials, the goods are first boiled in a soln. of  $H_2O$ ,  $NH_3$ , soda ash, and soap. They are then washed in hot soap liquor

and chemicked. According to the provisional specification, the material is chemicked both before and after the treatment with the hot soap liquor.

**Artificial viscose silk.** E. BRONNERT. U. S. 1,422,412, July 11. Fine viscose silk threads of 6 deniers or less are prepd. by forcing the viscose through the usual aperture of 0.10 mm. diam. into a pptg. bath contg. a concd. soln. of readily sol. bisulfites, the concn. of which is directly proportional to the fineness of the thread to be produced. Cf. C. A. 16, 837, 1016.

**Finishing artificial silk thread.** C. A. SNYDER. U. S. 1,423,041, July 18. A soln. of olive oil soap contg. olive oil is used for giving a gloss and improving tensile strength.

**Paste for cloth.** HAMAKICHI YOSHINO. Japn. 39,688, Aug. 30, 1921. The paste is a homogeneous mixt. of sol. starch 7, yellow dextrin 2, and casein 1,  $\text{NaHCO}_3$  5% may be added to produce a sol. paste.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**The paint industry.** A. H. SABIN. *J. Ind. Eng. Chem.* 14, 775(1922).—A brief review. E. J. C.

**Progress in the chemistry of naval stores, 1920-1921.** F. P. VEITCH AND V. E. GROTLISCH. *J. Ind. Eng. Chem.* 14, 781-4(1922). E. J. C.

**Water gas and coal gas tar paints.** J. HINDS. *Reclam. Rec.* (U. S.) 12, 21-3 (1921); *Expt. Sta. Record* 44, 687.—Different expts. on the preservation of irrigation structures by paints are reviewed. Tar paint is shown to be superior to any other paint for all kinds of submerged metal work. It is also considered very satisfactory for use on wood structures or in any place where a black paint with a slightly sticky surface is not objectionable. It is economical in first cost and is said to be easily and cheaply applied. H. G.

**Investigation of various varnishes and paints in regard to their rust-preventive properties.** MAASS AND JUNK. *Z. angew. Chem.* 35, 353, 360-3(1922).—Various substitutes for linseed oil such as cumarone resins, tar oils, phenol-aldehyde products, etc., used during the war, are generally unsatisfactory. At the instigation of the National Board for Metal Protection and the Marine Administration a series of tests, in comparison with boiled linseed oil, was made on tar oil preps., and on "Imprex" varnishes (manufd. by G. Ruth, Wandsbek). The latter are made from linseed oil with the addition of an inert colloidal thickening agent which effects a saving of up to 70% of the oil. The colloidal agent prevents penetration of the varnish, so that when it is applied to a porous surface such as paper, it does not strike through. These varnishes dry with a flat surface. Working qualities, spreading rates, elasticity of the films on bending, permeability to  $\text{H}_2\text{O}$  by detn. of the increase in wt. of coated wooden panels on immersion, effect of dry heat and of  $\text{H}_2\text{O}$  vapor at  $80^\circ$ , durability and rust prevention on exposure were detd. Boiled linseed oil showed greater permeability to  $\text{H}_2\text{O}$  and less protection against rusting than the other oils; in other respects the tar oil preps. were decidedly inferior; one of the "Imprex" varnishes had excellent elasticity, durability, and impermeability, and, on account of its high spreading rate, is very economical and serviceable for certain purposes. F. A. WERTZ

**Paint protection for wood.** C. T. MYERS. *Mech. Eng.* 44, 519-20, 545(1922).—There is great need for research on the dimensional stabilization of wood by rendering it moisture-proof. Curves and tabulations are given to show variations in the moisture content of air-dried wood under varying humidity conditions, increase in strength and



change in vol. of wood on drying, and of the  $H_2O$  absorption of wooden test panels painted with a series of primers. The usual oil paints are not effective waterproofing coatings; varnishes are more effective than paints, but they are not suitable for priming coats for certain work. Casein solns. and pyroxylin compds. are effective for some classes of protection.

F. A. WERTZ

**Miscellaneous exposure tests.** HENRY A. GARDNER. Paint Mfrs. Assoc. of U. S., *Circ.* 153, 282-313 (June 1922).—After 3 years exposure, an inspection of the U. S. Naval Hospital shows that brush and spray coats have equal durability (cf. *C. A.* 15, 784). Three yrs. exposure of the Atlantic City panels confirms the results of inspection after two years exposure (cf. *C. A.* 15, 3214). The basic Pb chromate paints are still in excellent condition; the red lead films are still intact but have faded badly. The examn. of paints contg.  $TiO_2$  and exposed for 20 months shows that this pigment, in combination with ZnO and an inert other than whiting, gives good results. Sb oxide, in various combinations with ZnO, white lead, lithopone, and inerts, shows a strong tendency to chalking after exposure for 16 months. Paints exposed in the Texas sulfur regions, and composed of combinations of  $TiO_2$ , lithopone, ZnO and inerts are in very good condition after 10 months. Those contg. leaded Zn were badly darkened, but bleached to their original whiteness after closing down of the adjacent S company. Illus. with photomicrographs, etc. All results are tabulated.

F. A. WERTZ

**Fighting corrosion as a major source of waste in industry.** R. H. HUBBELL. *J. Elec. Western Ind.* 49, 9-11 (1922).—A general paper with a series of illustrations purporting to show that the judicious use of paint will often prevent corrosion of iron and steel.

C. G. F.

**A color change cabinet for determining the discoloration of interior whites.** HENRY A. GARDNER. Paint Mfrs. Assoc. of U. S., *Circ.* 152, 279-81 (June 1922).—The app. consists of a double-chambered cabinet. The walls of one chamber are coated with a flat white paint and illuminated with a 75 watt Daylo Mazda lamp that maintains a temp. of  $48^\circ$  to  $56^\circ$ ; while the interior of the other chamber is painted a flat black and maintained at a temp. of approx.  $28^\circ$ . Sheets of blotting paper satd. with  $H_2O$ , on the floor of the cabinet, maintain high humidity. The chambers are used to study the yellowing of white paints, the drying of paints and varnishes in humid atms., etc.

F. A. W.

**Tung oil testing and specifications for soy bean and perilla oils.** HENRY A. GARDNER. Paint Mfrs. Assoc. of U. S., *Circ.* 150, 265-8 (May 1922).—The proposed tentative specifications of Sub-Com. III on Paint Vehicles, of Com. D-1 on Coatings for Structural Materials, Am. Soc. Testing Materials, for tung oil make the following revisions (cf. *C. A.* 10, 974): acid no. (alc.-benzene method), 7 (max.); I no. (Wijs), 163 (minium); heating test (revized method, *C. A.* 14, 3804), 12 min. Details of the heating test are given. Proposed tentative specifications for soy bean oil: foots, 2.5%; loss on heating at  $105^\circ$ , 0.2% (max.);  $d_{15.5}^{20}$ , 0.924 (min.); acid no., 5.0 (max.); sapon. no., 190 (min.); I no. (Hanus), 128 (min.); unsapon. matter, 1.5% (max.); color, not darker than 1 g.  $K_2Cr_2O_7$  in 100 cc. concd.  $H_2SO_4$ . Proposed tentative specifications for perilla oil are the same as for soy oil except  $d_{15.5}^{20}$ , 0.932 (min.); and I no. (Hanus), 191 (min.). (Cf. *C. A.* 16, 841).

F. A. WERTZ

**Ochers from Jamaica.** ANON. *Bull. Imp. Inst.* 20, 10-2 (1922).—An investigation of 7 samples of crude ochers from Jamaica showed that by suitable treatment refined pigments could be prepd. from them, but the color and strength of the products are not sufficiently good to enable them to be marketed profitably in the United Kingdom. They were refined by grinding with small quantities of NaOH soln. and subsequently levigating; dil.  $H_2SO_4$  was added to the liquid contg. the purified pigment in suspension in order to effect its pptn. Calcination of the purified product for 1 hr. at

red heat caused slight brightening (except in one case), but the differences were not sufficient to add to the com. value of the others. A. P.-C.

**The light fastness of lithopone.** CAMILLE ROCHES. *Rev. chim. ind.* 31, 109-11 (1922).—The blackening of lithopone under the action of sunlight (or ultra-violet rays) is due to the presence of impurities, and especially of Cl, the addn. of 0.002% Cl causing blackening in ultra-violet light. The presence of Fe, Cd, Co, Mn and even Ra does not cause blackening. The simplest and surest method of preventing the action of light is to surround each particle of the pigment with a film of a substance on which light has no action (ZnO,  $Al_2O_3$ ,  $BaSO_4$ ). R. claims to have discovered a process for doing this, but gives no details. A. P.-C.

**Elasticity tester for varnishes.** HANS WOLFF. *Chem. Umschau* 29, 218-20 (1922); cf. *C. A.* 15, 3756.—W. det. elasticity of varnish by measuring the angle at which a test-strip of varnished tin or paper shows signs of fracture, or by counting the no. of bendings necessary to produce fracture. The nature of the fracture-crazing, scaling, cracking, etc., is also considered. The app. consists of 2 beveled and hinged pieces of wood, to one of which is fastened a slide; the test pieces of tin are tacked across, with one end tacked on one board and the other end on the slide on the other board. By closing and opening carefully the test strips are bent and the angle is then measured. P. ESCHER

**The wearing quality and physical tests of several exterior varnishes compared with their chemical analysis.** W. T. PEARCE AND E. V. LADD. *N. Dakota Sta. Paint Bull.* 1, 116-29 (1919); *Expt. Sta. Record* 45, 318.—The results are reported of a no. of phys. tests, chem. analyses and service tests of several exterior, interior, and floor varnishes. As these studies are to be continued, no definite or final conclusions have as yet been drawn. H. G.

**Philippine resins, gums, seed oils, and essential oils.** A. P. WEST AND W. H. BROWN. *Philippine Bur. Forestry Bull.* 20, 230 pp. (1920); *Expt. Sta. Record* 44, 640-1.—An illustrated survey of trees and other plants of the Philippine Islands yielding these forest products. Certain cultivated plants, such as the coconut palm, peanut, etc., are included for the sake of completeness. The different species are considered from a botanical standpoint, but emphasis is placed upon the products, their properties and uses. H. G.

**Larch (Venice) turpentine from western larch (*Larix occidentalis*).** S. A. MAHOOD. *J. Forestry* 19, 274-82 (1921); *Expt. Sta. Record* 45, 416-17.—An examn. of the oleoresin from western larch (*L. occidentalis*) is reported. The oleoresin, which has the consistency of honey, is amber in color, has a slightly bitter taste and agreeable odor, and was found to contain approx. 16% of a volatile oil consisting chiefly of  $\alpha$ -pinene together with smaller amts. of  $\beta$ -pinene and  $\alpha$ -limonene. The nonvolatile portion consisted of a resin possessing acid properties but yielding no cryst. product. The principal constants of the oil were acid no. 90.2, sapon. no. 97.6, ester number 6.4, and sp. gr. 1.0054. It is pointed out that while the acid value is high and the ester value low as compared with the com. standards for Venice turpentine, the values more nearly approach those of the oil from *L. decidua* than do the results obtained by Schorger on Douglas fir turpentine (*C. A.* 11, 1956). "Two properties make Venice turpentine of value for particular purposes: It does not readily become hard on exposure; and, after standing, crystals do not form in it. The oleoresin from western larch possesses these properties, and tests made by a com. firm indicate that western larch turpentine is a satisfactory material for all those industrial purposes for which Venice turpentine is ordinarily used." H. G.

**Esterification of fossil resins, and the production of neutral varnishes therefrom.** H. A. GARDNER AND P. C. HOLDT. *Paint Mfrs. Assoc. of U. S., Circ.* 151, 269-78

(May 1922).—It is often desirable to neutralize highly acid resins such as Congo, Manilla, and Pontianac, so that varnishes made from them will not liver when used with basic pigments. Lab. expts. to esterify Congo resin with glycerol show that it may be neutralized to an acid no. of 5 to 20. Unless the Congo is completely "run," it polymerizes on addition of glycerol to a frothy, spongy, voluminous mass. For complete "running," the gum had to be heated at 315–325° for 1.5 hrs. Addition, at 280°, of a slight excess of glycerol, and holding at 292–295° for about 30 min. usually effects sufficient reduction of acidity. Longer heating further reduces acidity but darkens the products. Addition of a small quantity of Zn accelerates esterification. In Cu or Al kettles, polymerization of the resin on addition of glycerol is much more likely to occur than in glass vessels, but this is caused by greater likelihood of incomplete "running," and not by any catalytic action of the metals (cf. C. A. 16, 1324). Manilla and Pontianac resins are esterified the same as Congo except that a shorter time is required for running. Enamels made from varnishes contg. esterified resins and ZnO remained in perfect condition: while those made from varnishes contg. the same resin not esterified livered very badly. The esterified Congo was unaffected by immersion for 1 wk. in 4% and 16% NaOH soln., while the unesterified was badly attacked. F. A. WERTZ

**Resinates and their applications.** MAURICE DE KEGHEL. *Rev. prod. chim.* 25, 433–6, 469–74 (1922).—A general description of the prepn. of the various alkali and metallic resinates and of their applications in the paper, paint and varnish and ceramic industries. A. P.-C.

**Inks for rubber stamps.** ANON. *India Rubber J.* 62, 578 (1921); *J. Soc. Chem. Ind.* 40, 780A.—Expts. made in the British Gov. Lab. showed that of the materials commonly used as mediums or as thinners in rubber stamp inks, glycerol exerted no deleterious action on the stamp. Although castor oil also had no appreciable action on the rubber, the thinners necessary to reduce it to working consistency, such as turpentine and its substitutes, caused disintegration of the rubber. Rosin oil, rosin spirit and paraffin oil caused the rubber to swell; the first of these produces less softening effect than the other two. C. C. DAVIS

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Nitrocelluloses; lacquers (Brit. pat. 177,536) 23.

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KEGHEL, MAURICE DE: *Manuel du fabricant d'encre, cirages et colles et leur preparation*. Paris: J. B. Baillière et fils. 19 rue Hauteville. 384 pp. fr. 10. Reviewed in *Rev. prod. chim.* 25, 344 (1922).

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**Paint vehicle.** W. N. BLAKEMAN, JR. U. S. 1,423,389, July 18. Coconut oil 10, tung oil 15 and cottonseed or linseed oil 85 parts are used with white lead or other pigments.

**Paint.** W. N. BLAKEMAN, JR. U. S. 1,423,390, July 18. A fatty oil such as cottonseed oil and zinc-lead or other pigment are mixed with coconut oil, tung oil and mineral oil such as oxidized Texas oil in order to form a paint adapted for exposure to the weather.

**Pigment for paints.** W. N. BLAKEMAN, JR. U. S. 1,423,391, July 18. A paste pigment is formed of coconut oil, tung oil and an anhydrous pigment such as ZnO, lithopone or zinc-lead.

**Oil mixture for paints.** W. N. BLAKEMAN, JR. U. S. 1,423,392, July 18. A mixt. of coconut oil or palm-kernel oil and tung oil is used with paint or varnish vehicles.

**Water paint.** A. L. RICE. U. S. 1,423,256, July 18. A waterproof water paint is prepd. by first making a dry powder contg. casein and lime capable of forming a

water paint on addition of  $H_2O$ , adding sufficient  $H_2O$  to the powder to form a thick paste which is stirred until uniform, thinning to a thick creamy mass by further addition of  $H_2O$  and then adding one-fourth the vol. of the creamy mixt. of a water-proofing soln. composed of paraffin oil dissolved in gasoline or other volatile solvent and emulsifying the ingredients together.

**Deodorizing paints.** A. C. HOLZAPFEL. U. S. 1,422,711, July 11. Paint contg. residual pitch derived from fats and oils is "deodorized" by addition of 1-5% acetone or butyl or amyl acetate.

**Lithopone.** J. L. MITCHELL. Brit. 177,123, Sept. 1, 1920. App. for calcining the mixed ppt. in the manuf. of lithopone comprizes a calcining chamber with airtight charging means, an internal conveyer provided with reversing means so as to move the material longitudinally backwards and forwards for agitating purposes, and a discharge chamber extending below the surface of  $H_2O$ . A detailed description of the app. is given in 173,567.

**Grinding paints.** P. O. ABGÉ, INC. Brit. 176,794, March 8, 1922. Pigment and a light vehicle are ground together in a ball mill contg. egg-shaped flint pebbles or metallic balls or slugs. A heavier vehicle is then introduced and the grinding continued. Preferably a vacuum is maintained in the container.

**Dye mixture for use as a stain.** A. MURRAY. U. S. 1,422,292, July 11. A stain adapted for use on wood is prepd. from a dye such as an acid dye, a protective colloid, e. g., linseed-oil soap, and a mixt. of sol. and insol. (as to  $H_2O$ ) org. solvents (e. g., iso-butyl alc., EtOH, toluene and acetone) which will not destroy soap nor readily dissolve dried glue.

**Poison for Tereido, Xylotrya, etc.** TAIZAN SHIGA. Japn. 39,690, Aug. 30, 1921. Whale oil, or a mixt. of whale or other animal oil and fish oil, 133 parts is mixed with 80 parts  $CuCO_3$  and heated for 4-5 hrs. Of this product 150 parts is mixed with 50 parts of Cu resinate and dissolved in 1,000 parts of coal-tar oil (sp. gr. above 1.03). Cf. C. A. 16, 1327.

**Varnish.** HIROSHI TAMAMI, GENSHICHI OHMURA, and KWANSAI PAINT KABUSHIKI KAISHA. Japn. 39,623, Aug. 20, 1921. Varnish is manufd. from oxidized white camphor oil, oil of *Paulownia imperialis* or other drying oil, such as linseed oil, colophonium, and Mn resinate. It has a high drying power and the film produced is lustrous and elastic.

**Liquid enameling composition.** C. D. HOCKER. U. S. 1,422,861, July 18. A combination of glycerol, Congo copal, castor oil or other oil and free fatty acid gelatinizes when heated and may be used as an enamel.

**Invisible ink.** C. F. MORSE. U. S. 1,423,246, July 18. An aq. soln. of basic ferric sulfate is mixed with  $H_3PO_4$  equiv. to 25-75% the wt. of ferric sulfate.

**Synthetic polyglycerol resin.** L. WEISBERG and R. S. POTTER. U. S. 1,424,137, July 25. Polyglycerols are heated with a dibasic aromatic acid or a polybasic aliphatic acid to obtain synthetic resins which are much stronger than the synthetic resins similarly prepd. from glycerol. Among the acids which may be used are: diphenic, 1,8-naphthalic, benzoylbenzoic, chlorobenzoylbenzoic, methylbenzoylbenzoic, succinic, malic, tartaric, maleic, fumaric, citric or malomalic. The formation of the resinous products is carried out in much the same manner as in prep. resins from glycerol but the reactions take place much more rapidly than in the case of glycerol.

**Ink.** E. S. GARVEY. U. S. 1,422,957, July 18. A writing or lettering ink is formed from an aniline dye 3 oz., alc. 4 gals. and shellac 6 lbs.

## 27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

**The synthesis of the higher fatty acids and the preparation of artificial fats.** MAURICE DE KEGHEL. *Rev. chim. ind.* 31, 89-98(1922).—A critical review of recent German articles. A. P.-C.

**The chemistry of fats.** EMILE ANDRÉ. *Bull. soc. chim.* 31, 459-525(1922).—This article is a discussion of the methods of fat analysis, the sepn. and identification of fatty acids, and of glycerides and the principal constituents of fats. E. SCHERUBEL.

**Standard methods of analysis.** A. EIBNER. *Chem. Umschau* 29, 159-60, 168-71 (1922).—From work on the relation of I no. to the Maumene thermal value, E. concludes: (1) The thermal no. of non-drying oils can be detd. with 92.5%  $H_2SO_4$ ; oils of the linseed class must first be dild. (2) The max. heat evolution in olive, peanut and rape oil occurs at an oil: acid ratio of 2 : 1. (3) An increasing thermal no. necessitates an increased oil: acid ratio. (4) It is essential to use one standard concn. of  $H_2SO_4$  and on account of the violent reaction of concd. acid in the linseed oil group the 92.5% concn. has been selected for all oils. (5) A Pt stirrer gives the highest and an Al stirrer the lowest values, probably due to catalytic influences. (6) Oils of one group but from different localities furnish different values, and correct quant. results cannot be obtained for an unknown oil. (7) The thermal no. of an individual oil does not remain the same when mixed with other oils. (8) Oils of the linseed group are best dild. with 70% paraffin oil. (9) It is incorrect to calc. the I no. from the thermal no. by means of the Tortelli factors on account of the variation in oils of different origin. (10) The Maumene thermal reaction gives in its present form sharp results for pure oils, supplementing the I no. and hexabromide no., and even distinguishes oils of the same group as to their origin. (11) The diagnostic value of this reaction is lessened for mixed oils because their thermal value changes by mixing. (12) The thermal reaction is not only an addn. of  $H_2SO_4$  but also a partial sapon. and oxidation. In the detn. of the B<sub>n</sub> no. and I no. the halogen only is added. (13) To make the thermal reaction a standard method the previous history of the oil must be known in order to have comparable conditions, including method of extn., age and treatment. (14) Perilla oil furnishes the highest value, 127.24; Chinese wood oil is the only oil whose value thus far could not be detd. because it coagulates with  $H_2SO_4$ . P. ESCHER

**Official methods adopted by the Chemists Committee and the Rules Committee of the Cotton Seed Crushers' Association of Georgia.** *Proc. Ga. Cotton Seed Crushers' Assoc.* 16, 120-34(1920); *Expt. Sta. Record* 45, 719.—Methods are included for the analysis of cottonseed hulls, cake, and meal; crude cottonseed, peanut, coconut, and soy-bean oils; refined oils; and soap stock and acidulated soap stock. H. G.

**Samplers and sampling of vegetable oils.** P. W. TOMPKINS. *Cotton Oil Press* 5, No. 8, 29-32(1921).—A number of instruments are described for sampling tank cars, steamers, storage tanks, and methods for drawing samples from pipe lines during passage of oil through them are given. Detail drawings of the samples are shown. It is important that a sampler be so constructed that it will properly sample the very bottom of a tank. Tank cars cannot be properly sampled by the customary "core" sampler. It presumably removes a core of uniform size from top to bottom of the car, but since the cross section of a tank car is a circle more oil should be drawn from center than the top or bottom. This can be overcome by so called "zone sampling," i. e., drawing small samples from diff. depths in the tank and taking the most near the middle. H. S. B.

**The determination of the iodine number of aliphatic and aromatic unsaturated compounds.** D. HOLDE, P. WERNER, IDA TACKE AND C. WILKE. *Chem. Umschau* 29, 185-8(1922).—Hübl's reagent for the detn. of I no. reacts very slowly toward unsatd.

aromatic compds. in which the double or triple bond adjoins the carboxyl group as in phenylacrylic and phenylpropionic acids (*Ber.* 24, 4117(1891)), and likewise slowly toward the aliphatic 2, 3 oleic and crotonic acids (Ponzio and Gastaldi, *C. A.* 6, 3096), in which the double bond also adjoins the carboxyl group. A similar behavior is shown by behenic acid,  $C_{22}H_{44}O_2$ . But the unsatd. acids which occur in oils and fats belong to the normally constituted aliphatic series for which the Hanus reagent gives uniform results agreeing with theory, and is the most convenient to prepare. For the sake of economy, only 50% of halogen excess is recommended. Pure oleic anhydride gave an I no. of 92.37 and 92.21, pure erucic acid 74.3 and 74.1 and erucic anhydride 76.38 and 76.22 (theory requires 92.98, 75.1 and 77.08, resp.). Cholesterol, an aromatic alc., reacts with Hübl's soln. more rapidly than phytosterol; both give after 24 hrs. results near the theoretical value of 65.7, but Wij's soln. gave after  $1\frac{1}{2}$  hr. results which were twice as high (134.5–135.4) for these two ales. Since the naphthenic acids from Russian and Galician petroleum also show much higher values ( $X_4$ ) with Wij's than with Hübl-Waller soln. and since the unsapon. matter of wool fat-olein, originating from cholesterol derivs., behaves similarly and in addition their I Nos. with Hübl-Waller soln. fall with increasing b. p. and increasing  $n$  while they rise with Wij's soln., the authors see in this behavior a strong support for Marcusson's theory that the optical activity of the various *petroleums* rests on a cholesterol origin.

P. ESCHER

**Moisture Committee (of the A.O.C.S.). Report for 1920–1921.** W. D. RICHARDSON. *Cotton Oil Press* 5, No. 7, 34(Nov. 1921).—A special glycerol-water-jacketed drying oven for drying cottonseed meal at  $102^\circ$  is recommended. The suggested time is 4 hrs.

H. S. B.

**The vegetable oil industry.** DAVID WESSON. *J. Ind. Eng. Chem.* 14, 809–10 (1922).—A review.

E. J. C.

**Solvent extraction of vegetable oils.** C. F. EDDY. *J. Ind. Eng. Chem.* 14, 810–1 (1922).—A review with bibliography.

E. J. C.

**High extraction not high oil loss.** H. E. WHITE. *Cotton Oil Press* 5, No. 6, 34 (1921).—The relative amts. of hulls and meats from the same quality of cottonseed from diff. places and from the same place at diff. years does not change materially. First class seed run about 43% hulls and 57% meats. There is however a great difference in the compn. of the meats, amounting to 6 or 8 gals. of oil or 25 lbs.  $NH_3$  per ton. The high  $NH_3$  seed will yield more cake per ton if mill work be judged solely by the percentage of oil in cake one running on high  $NH_3$  seed, therefore low oil, while making more cake, may lose more oil than another mill working low  $NH_3$  seed, and still show a less percentage of oil left in its cake. Mill standing should be based on actual gals. of oil left in the cake made from a ton of seed.

H. S. BAILEY

**Advantages of extraction batteries over individual apparatus with simple displacement.** SIGGFRIED ZIPSER. *Seifensieder Ztg.* 49, 443–4, 460–1(1922).—In the extn. of oil by displacement, batteries, in which the partly satd. solvent is used to ext. fresh material, show the following advantages over individual extractors in which the material is treated with pure solvent only, the comparison being based on the same quantity of raw material in each case: (1) less first cost; (2) less labor in operating; (3) less solvent in circulation; (4) less steam; (5) less loss of solvent; (6) less condensing  $H_2O$ ; (7) greater capacity; (8) the extd. residue retains no trace of solvent. P. E.

**Agitation in edible oil treating.** J. P. HARRIS. *Cotton Oil Press* 5, No. 8, 27–8 (1921).—Agitation with compressed air in the usual NaOH refining of crude vegetable oils is sometimes practised to-day. The objections to the use of compressed air are that (1) it often produces a heavy emulsion causing high oil loss, (2) it is almost impossible to free it from traces of mineral oil, (3) and it may partly oxidize the oil and impart to it off flavors. Early types of mech. agitators were crude and even the present equip-

ment of many refineries does not quickly mix the oil and lye. A new circulatory system consisting of 2 marine propellers mounted on sep. perpendicular shafts revolving in opposite directions gives satisfactory agitation at minimum cost. It is claimed there is less sapon. of neutral oil during refining, less fullers earth or other bleach is required in bleaching, and in hydrogenation the hardening proceeds more rapidly where this system is used.

H. S. BAILEY

**Effect of silicate of soda used in lining of barrels for edible oils.** C. BLOSS. *Cotton Oil Press* 5, No. 8, 34(1921).—A soapy flavor in coconut oil was traced to the Na silicate used in lining the barrels in which the oil was shipped. Bbls. lined with an edible grade of glue are more satisfactory.

H. S. BAILEY

**Kapok oil.** H. P. TREVITHICK AND W. H. DICKHART. *Cotton Oil Press* 5, No. 8, 34(1921).—A sample of kapok oil (origin not stated) was analyzed with the following results:  $H_2O$ , 0.45%; insol. impurities, 0.36%; I. No. (Wijs), 94.9; sapon. no., 194.5;  $n_{20}$ , 35.0%; color refined oil, 35Y 7.0 R; titer, 28.1°; titer of soapstock, 30.2°; Halphen test, strong.

H. S. BAILEY

**Refining coconut oil.** A. W. KREBS. *Inst. Margarin Manufrs. Proc.* 2, 56-61 (1921); *Expt. Sta. Record* 46, 109.—A brief description is given of the process of refining coconut oil, including the process of hydrogenating the oil.

H. G.

**The five million dollar coconut oil industry in the Northwest.** FRANK W. WATSON. *J. Elec. Western Ind.* 49, 85-8(1922); 6 illus.—A brief outline of the process is given together with details as to equipment.

C. G. F.

**Fluorescence in cottonseed oil.** R. H. FASH. *Cotton Oil Press* 5, No. 9, 31(1922).—Since it is believed that mineral oil has its origin in glycerides and waxes, the fluorescence produced in some cottonseed oils by scorching the meats during cooking may be looked on as due to a mineral oil. Oils which after refining have a distinct fluorescence and red color should be considered as contaminated with mineral oil under the Interstate Cottonseed Crushers' Assoc. Rule 146.

H. S. BAILEY

**The specific gravities of cottonseed of varying oil content.** T. B. REED. *Cotton Oil Press* 6, No. 6, 34-5(1921).—An unsuccessful attempt to obtain the percentage of oil in cottonseed by a detn. of the sp. gr. of the seed.

H. S. BAILEY

**The content of free fatty acids in palm oil.** F. C. VAN HEURN. *Commun. Gen. Expt. Sta. Alg. Ver. Rubberplanters Oostkust Sumatra, Gen. Ser.* No. 8, 1920, 14-31; *Expt. Sta. Record* 45, 720.—Conditions leading to a high content of free fatty acids in palm oil as usually manufactured are discussed, and suggestions are made for so improving conditions of picking the fruits and handling them before and after they reach the factory that a product of low acidity can be obtained.

H. G.

**Castor beans and castor oil—Cultural notes and the chemistry and uses of the oil.** M. RINDL. *S. African J. Ind.* 4, No. 6, 540-7(1921); *Expt. Sta. Record* 46, 109.—This article, which forms the first installment of the nondrying oils section of the report on vegetable oils, fats, and waxes previously noted (*C. A.* 15, 3509), deals with the cultivation, harvesting, and yield of castor beans in South Africa, and presents tabulated data on the consts. of castor oil obtained from South African seeds and a discussion of the uses of castor-bean products.

H. G.

**Chia seed oil.** *Bol. agr. ind. com. Guatemala* 1, No. 1, 21, 22(1921); *Expt. Sta. Record* 45, 613.—Detns. are reported of moisture, oil extd. with petroleum ether, and the fatty acids liberated from the oil of 6 samples of chia seed (*Salvia hispanica*). The oil, the yield of which varied from 23.19 to 39.87%, was of a clear greenish color bleaching on exposure to light. Its odor was similar to that linseed oil and in general this resemblance extended to other properties. It is thought that the oil might be preferable to linseed oil for paint on account of its remarkable limpidity and transparency.

H. G.

**Soy-bean investigation.** C. LADD. *N. Dakota Sta. Paint Bull.* 1, 130-8(1919); *Expt. Sta. Record* 45, 318.—This paper supplements the data on soy-bean oil in Bulletin 118 from this station (C. A. 11, 544) by similar data on the compn. of the oil obtained from soy beans of the 1915 and 1916 crops and of crops grown in 1918 from the seeds of 1916, the seeds in many cases being grown in different localities. A change in locality was found in some cases to alter the I value of the oil. In general beans giving a certain I no. in one locality showed a decided increase in I no. when grown in a colder climate and *vice versa*. An increase or decrease in I value appeared to have no consistent effect on the oil content of the bean, nor did the oil content affect the I no. H. G.

**Certain tropical oilseeds.** E. R. BOLTON AND D. G. HEWER. *Analyst* 47, 282-4 (1922).—

	(1.) Platonia inaguia. Bacury.	(2.) Andiro- binha.	(3.) Baillonella sp. Bey beans.	(4.) Minuopsis djave. for com- parison with (3). Pajura.	(5.) Theobroma grandifolia. Jaloty.	(6.) Theobroma bicolor. Cupu Assu.	(7.) Lupu.
Shell .....	—	83	13	50	50	20	25
				husk 6			
Kernel .....	—	17	87	50	19	50	75
% of oil on kernel ....	70.0	70.8	63.0	65-70	76.5	42-53	67
M. P. { incipient.....	34.4	—	33-9	—	—	40.6	34.3
{ complete.....	51.7	—	44-1	—	—	45.0	45.5
Setting point, °C. ....	43.3	—	—	—	—	38.9	—
Sapon. no. ....	191.8	236.8	180.3	184.2	194.5	227.3	189.2
% Unsapon. matter...	4.2	2-3	6.2	4.0	0.6	0.5	—
Iodine no. ....	63.3	52.7	60.7	65.1	98.0	5-9	44.3
Butyrefractometer at 30°C. (Zeiss).....	60.0	51.9	51.7	51.8	82.4	37.0	45.6
% Free fatty acids....	13-30	4-16	30	9.3	0.3	1-7	22
"Titer," °C. ....	—	31.2	—	52.8	—	—	—
Reichert-Meissl. no....	—	45.0	—	—	—	—	—
Polenske no. ....	—	0.5	—	—	—	—	—
Kirschner no. ....	—	26.7	—	—	—	—	—

E. SCHERUBEL

**Thea-seed oil.** J. J. B. DEUSS. *Meded. Proefstat. voor Thee, Batavia* 1914, No. 33, 1-18; *Chimie et industrie* 7, 1176(1922).—D. studied the oils of the seeds of *Thea assamica* and of *T. chinensis*. The av. oil content (on the dry seed) was 30-35%, and reached as high as 42%. The following consts. are given for *T. assamica*: d. 0.920, solidifying point -12°, sapon. no. 194, I no. 90.49. The flavor recalls that of olive oil. It is suitable for culinary purposes (the saponin is destroyed by cooking), for the manuf. of a hard, white soap of good quality, the detergent properties of which are improved by the saponin, and as a lubricant. A. P.-C.

**Kurrajong seed and oil.** J. K. TAYLOR. *Australian Forestry J.* 4, 295(1921); *Bull. Imp. Inst.* 20, 96(1922).—Kurrajong (*Brachychiton populenum*) contains 17.03% of a red clear oil, having the consistency of a heavy sirup, acid value 4.0, sapon. value 189.5, I no. 97.0, acetyl no. 5.8, Hehner no. 94.5, d. 0.9206,  $n_D^{20}$  1.471, titer test 26.8°. The oil is semi-drying, as detd. by comparative drying tests and the "elaidin" test. The press cake contained moisture 10.72, ash 4.34, crude protein 21.56,  $H_2O$  ext. 7.76, crude fiber 19.05, carbohydrates, etc., 36.57%, albuminoid ratio 1 : 2.5. A. P.-C.



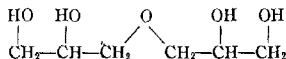
**The oil of Cape chestnut seeds.** ANON. *Bull. Imp. Inst.* 20, 5-7(1922).—Cape chestnut seeds (*Calodendron capense*, Nat. Ord. Rutaceae) from the East London District of the Cape Province were composed of 57% shell and 43% kernels, av. wt. of seeds 1.1 g., of kernels 0.5 g. The kernels contained 3.6% moisture and yielded on extrn. with light petroleum ether 59.2% of liquid oil, corresponding to 61.4% on the moisture-free kernels or 25.5% on the whole seeds. The extd. oil was lemon-yellow, slightly cloudy, had a faintly bitter taste, and showed the following consts. (consts. for a previous sample reported in 1908 are given in parentheses):  $d_{4}^{20}$  0.9219 (0.9190), acid value 0.4 (27.0), sapon. no. 192.6 (192.0), I no. 108.7 (98.4), unsaponifiable matter 0.5% (2.1%), sol. volatile acids 0.5, insol. volatile acids 0.2, titer test 26.8° (35.0°),  $n_{40}$  1.465. The meal left after extrn. of the oil was a cream-colored powder with bitter taste. The results of analysis calcd. for meal contg. 7.0% fat are: moisture 7.3, crude proteins 40.2, fat 7.0, carbohydrates, etc., (by diff.) 37.0, crude fiber 3.9, ash 4.6%, nutrient ratio 1 : 1.3, food units 155. It contained no cyanogenetic glucosides, but a substance giving reactions similar to those of alkaloids was present. The consts. of the oil are similar to those of cottonseed oil. It probably could not be used for edible purposes on account of its slightly bitter taste, but might be suitable for soap making or other technical uses. The nutritive value of the meal is slightly superior to decorticated cottonseed cake, but it has a bitter taste which would render it unpalatable to cattle, and on account of the presence of an alkaloidal substance it should be used as a fertilizer rather than as a feed. A. P. C.

**Soap manufacture.** J. A. KYLE. *Cotton Oil Press* 5, No. 9, 28-31(1922).—A general survey of soap manuf. covering the history of its development, chemistry and the theory of the washing action. H. S. B.

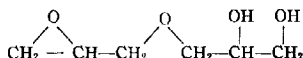
**Effects of salts in soaps.** K. I. WEBER. *Seifensieder Ztg.* 49, 458-60, 479-81, 494-5(1922).—A popular discussion of the effect of caustic alkalies, carbonates, chlorides, and Na silicate on the consistency and phys. behavior of curd soaps and soft soaps. P. ESCHER

**The deglycerolation of fats.** RAFFAELE SANSONE. *Rev. chim. ind.* 27, 117-21, 238-44(1918); 28, 169-75 (1919); 29, 79-87, 180-6, 339-44(1920); 30 (1921); 31, 120-5 (1922); *et seq.*—A general write-up. A. P. C.

**Composition of the residue on distillation of crude glycerol.** ARCHIBALD RAYNER. *J. Soc. Chem. Ind.* 41, 224-5T(1922).—As the result of a long study R. concludes that the conversion of glycerol to volatile polymerization products gives rise to substances of 2 types. One class consists of products obtained by intermol. condensation of the diglycerol type with mols. linked thus:



The other is of the glycide type in which not only is there intermol. condensation, but also the original glycerol mol. itself has undergone internal condensation giving products of the type:



It is only by assuming the presence of these 2 types that the discrepant results of different observers of the properties of the volatile polymerization products can be explained. One observer by heating glycerol for 12 hrs. at 270° to 280° and sepg. that proportion of the distillate b<sub>1</sub> 210-250° obtained a product having ahydroxyl value 34.0% and a viscosity 5 times that of glycerol. By boiling glycerol alone for a longer time and distg.

at 10 mm. R. obtained a large fraction b. 260–265° and having a hydroxyl value of 38.0% and a viscosity 13 times that of glycerol. As the product having the higher hydroxyl value has a much greater viscosity it follows that there must be present in the first distillate another distinct class of compds. of the glycidic type possessing low viscosity and low hydroxyl value, such as the glycidic of glycerol, diglycerol and triglycerol, the latter being said to be formed when polyglycerol are distd. From their mol. structure it follows that the hydroxyl values are low, and they are known to be thin liquids having b. p. lower than the parent glycerols. The presence of such substances in distd. glycerol recovered from residues by a special process has been very evident. A distillate redistd. at 10 mm. and that portion sepd. which boiled at 174° to 176° was further treated with phosphotungstic acid and redistd. The product was apparently pure glycerol but its glycerol value when detd. by the I. S. M. gave 96.3% glycerol and sp. gr. 1.2641. If in this case it were assumed that the product was a mixt. of glycerol and diglycerol the proportions would be 86% of the former and 14% of the latter, a compn. which in view of the b. p. is impossible. The low glycerol value can only be explained by the presence of smaller amts. of another compd. of similar b. p. to glycerol, but having a much lower hydroxyl value. Such figures are characteristic of these distillates and it is on this account that no information as to the relative amts. of diglycerol and glycerol can be obtained from the hydroxyl value of the mixed products. E. S.

**Glycerol losses in vacuum evaporation.** I. CHAZANOVICZ AND M. PICKARSKI. *Seifensieder Ztg.* 49, 443 (1922).—In a factory test in which 37 charges of purified glycerol waters from autoclave cleavage were worked up, a loss of 10.5% glycerol was found, the dichromate method being used to det. the glycerol content before and after evapn.

P. ESCHER

Tests on the utilization of vegetable oils as a source of mechanical energy (ANON.)

21. Tests of an internal-combustion motor using palm oil fuel (GOFFIN) 21. Palm oil motors (MAYNÉ) 21. The exploitation and utilization of grape marc (VENTRE) 16. Philippine seed oils (WEST, BROWN) 26. The nature of the fatty acids obtained by oxidation of lignite tar oil (WENTZEL) 21. Solutions and sols. Deterative action of soap (GILLET) 2.

FRITSCH, J.: *Fabrication et raffinage des huiles végétales*. 3rd Ed. revized. Paris: Librairie Desforges, 29, quai des Grands-Augustins. 723 pp. Fr 45. Reviewed in *Bull. soc. ind. Mulhouse* 88, 321 (1922).

FRYER, P. J. and WESTON, F. E.: *Technical Handbook of Oils, Fats and Waxes*. Vol. I, 3rd Ed. Cambridge, Eng.: Univ. Press. 288 pp.

GRINENCO, I., CAPONE, G., and COSTA, M.: *Oleaginous Products and Vegetable Oils*. Rome: Inst. Internatl. Agr. Serv. Statist. Gen. 443 pp.

**Purifying oils and fats.** H. PLAUSON and J. A. VIEILLE. *Brit.* 178,183, Jan. 7, 1921. Oils, fats, liquid or solid hydrocarbons, tar and tar oils are refined by subjecting them to intensive mechanical disintegration, preferably in a colloid mill, as described in 155,836, with a non-solvent such as H<sub>2</sub>O to form an emulsion, and afterwards sepg. the emulsion from colloidal and other solid material, preferably by ultrafiltration under high pressure. The emulsion may be formed in H<sub>2</sub>O in the presence of a heavy metal or alk. earth compd. such as Ba(OH)<sub>2</sub>. Examples are given of the treatment of cottonseed oil, a mineral oil, and of wood tar. The oil emulsions after ultrafiltration are coagulated by addition of a reagent, e. g., neutral salt or acid. or by heating. Tar, after mechanical treatment with H<sub>2</sub>O, is allowed to settle, in order that coarse mineral impurities may deposit, after which the emulsion is subjected to ultrafiltration, the pitch remaining on the filter.

**Cleansing compositions.** A. M. PITMAN. *Brit.* 177,276, Dec. 31, 1920. A cleanser is prepd. by boiling a mixt. of the following substances, and preferably in the proportions stated: carbolie soap 1 lb., fine sand 1 lb., petroleum jelly  $1/4$ - $1/2$  lb., pumice powder  $1/4$  lb., and glycerol  $1 1/2$  ozs. According to the provisional specification,  $H_2O$  is used in place of glycerol.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

**Report on sugar-house products.** J. F. BREWSTER. *J. Assoc. Official Agr. Chem.* 5, 437(1922).—Work on detn. of ash in cane sirups and molasses was continued, as recommended in the previous report (*C. A.* 15, 2207), but not enough data were obtained to warrant conclusions. The following recommendations are made: (1) that the study of ash detn. by both the direct and sulfate methods be continued. (2) That a comparative study of methods for the detn. of sp. gr. and of total solids of molasses be undertaken.

F. W. ZERBAN

**A case of damaged Java white sugar.** CHARLES MÜLLER. *Intern. Sugar J.* 24, 358-9(1922).—M. describes the deterioration of a 30-ton lot of Javan white crystd. sugar in transit from Hong Kong to Port Said. A similar quantity of the same class of sugar, but in a different lot, arrived on the same steamer in first class condition. The damaged sugar had decreased in sucrose, and increased in % of moisture. M. concluded that the deterioration was due to the inversion of the sucrose, resulting from the action of the free  $H_2SO_4$  in the sugar. The temp. and humidity were claimed to have promoted the oxidation of the  $H_2SO_4$  originally present into free  $H_2SO_4$ .

W. L. O.

**What is "Demerara" sugar?** F. I. SCARD. *Intern. Sugar J.* 24, 318(1922).—This term does not apply to all sugars from Demerara, but only to those made by a special process requiring the greatest care and cleanliness. This sugar can only be made from the juice of certain cane, and it has been described by one authority as the product of the Bourbon Cane. As this variety of cane is now practically defunct, the real Demerara sugar is rapidly passing out of existence.

W. L. OWEN

**Influence of climate on the yield and quality of sugar beet in Canada.** E. G. McDougall. *Can. Bur. Statis., Mo. Bull. Agr. Statis.* 13, No. 146, 295-301(1920); *U. S. Mo. Weather Rev.* 49, No. 7, 395(1921); *Expt. Sta. Record* 46, 115.—The correlations between the percentage of sugar and the weather factors are decidedly small, but the coeff. of purity (the percentage of sugar in the dissolved solids) is more significantly related to weather conditions, having its highest correlation (a positive one) with the mean min. temp. for the season. The yield shows a positive relation with both max. and min. temps., and most significantly with the mean temp. for the season. It has a high positive correlation with the relative humidity, and an unexpected low one with the rainfall. The yield is closely related to the mean temp., and, in a less degree, to the mean relative humidity of the growing season. Conditions are favorable when the mean temp. exceeds  $60^\circ F.$  and the relative humidity exceeds 80%. They are unfavorable when the temp. falls below  $55^\circ$  and the relative humidity below 70%. Within ordinary limits the yield is not very greatly affected by the rainfall, provided the crop is thoroughly cultivated. In semiarid regions irrigation increases the yield without impairing the quality. The quality of the beets depends chiefly on the night temps.; the sugar content and purity decline when the mean temp. for the season falls below  $45^\circ$ .

H. G.

**The loss of sugar through the presence of fine grain in the final molasses.** JAR. DEDEK. *Intern. Sugar J.* 23, 327-30(1921).—H. Kalshoven (*C. A.* 14, 860) found

that the microscopic grain of colonial molasses amounted in some cases to 18%. E. O. Von Lippmann in similar studies of run-off from beet sugars found 1-13% of grain. A. Schweitzer disagrees with these findings from a practical standpoint, and has pointed out that the addition of 3-5% of sugar dust to a molasses previously freed from suspended grain would convert it into a massecuite. D. modifies the refractometric method of K. by dissolving the grain by heat instead of dilg. it. The molasses is heated in a specially constructed autoclave, a cut of which is shown. Refractometric readings before and after heating give the basis for calcg. the grain present. The accuracy of the refractometer readings has been greatly increased by a special lighting arrangement by means of which the light is thrown upon the upper prism of the instrument. The av. amt. of grain found in molasses by this method was 6.9%. The error of the diln. method is shown by the fact that a sample showed 4.89% of grain when the diln. was 97.3, and only 1.8 with a diln. of 21.4% of water.

W. L. OWEN

The composition and utilization of exhausted molasses in Mauritius. H. A. TEMPANY AND C. D. D'AVOINE. *Mauritius Dept. Agr., Gen. Ser., Bull* 21, 15 pp. (1921); *Expt. Sta. Record* 45, 818; cf. *C. A.* 15, 1635.—Data on the production, chem. compn., and possible uses as sources of fuel and fertilizer of the waste molasses of Mauritius are presented. A conservative est. places the av. annual production of exhausted molasses on the island at approx. 41,000,000 l. (10,832,200 gal.). It is estd. from the analytical data that the vol. yield of abs. alc. should av. 43.5% of the molasses fermented. Attention is drawn to the possibility of substituting vinasse for molasses as a fertilizer. It is shown that molasses is a valuable fertilizer on the island, but the data indicate that satisfactory results can also be obtained from the use of vinasse. The main difficulty in its employment as a fertilizing material consists in the bulk of liquid to be handled.

H. G.

Moisture absorptive power of different sugars and carbohydrates under varying conditions of atmospheric humidity. C. A. BROWNE. *J. Ind. Chem. Eng.* 14, 712-4 (1922).—At 20° and 60% relative humidity, starch among 17 vacuum dried carbohydrate products absorbed the greatest amt. of moisture (1.04%) within 1 hr., and sucrose the least (0.04%). In 9 days, under the same conditions, agar took up the max. of moisture (20.34%), and sucrose again the min. (0.03%). Levulose, which is generally considered to be very hygroscopic, absorbed only 0.63% moisture. But at 100% humidity levulose and products containing it take the lead, com. invert sugar absorbing in 25 days 76.58% water, and levulose and honey only little less; mannitol took up only 0.42% under these conditions. Upon reducing the humidity again to 60%, all the products, except lactose and raffinose, lost moisture, in the case of sugars which form monohydrates back to that required by this form. Equil. was reached in about 6 weeks, but with sucrose it took at least 2 yrs. In a general way moisture absorption rises with the humidity, but no fixed relationship between the two could be established. The practical importance of the results, in chem. manuf., in the flour and baking industry, and in plant physiology is pointed out.

F. W. ZERBAN

Purchase of sugar cane on basis of sucrose content. I. A. COLÓN. *Porto Rico Dept. Agr. and Labor Sta. Circ.* 33 (1920); [*Spanish ed.*] 37-42; *Expt. Sta. Record* 45, 536.—In a discussion of transactions in sugar cane, C. holds that purchase on a sucrose content basis is far superior to buying cane by weight. Where the first method was tried at Vannina central, striking differences in sucrose content, ranging from 21% to less than 10%, were noted between different varieties of equal maturity. Heavy rains, especially after a prolonged drought, reduced the sucrose while not affecting purity of juice. Ratoon canes were generally sweeter than plant canes, although producing less tonnage, and canes from uplands were richer in sucrose than those from bottom lands. Chem. fertilizers did not affect the sucrose content in the least, although they increased

the tonnage per acre. For success with the practice, the cane should be milled as soon as possible, care being taken to obtain representative samples, and the juice should be analyzed immediately.

H. G.

**Chemical variations in yellow-striped cane.** F. A. LÓPEZ DOMÍNGUEZ. *Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt.*, 1920, 77, 78; *Expt. Sta. Record* 45, 449.—An investigation was made by E. D. Colón to det. what effect, if any, the yellow-stripe disease of sugar cane had on the chlorophyll of the leaves. Spectroscopic observations showed that the spectrum of alc. solns. of the chlorophyll of diseased and healthy cane did not differ in any respect, indicating that the nature of the pigment was not altered by the disease. Another investigation was made to det. whether the yellow-stripe disease caused any inversion of the sucrose in the cane. The results are held to show that the disease had no effect on the sucrose content of the cane, and that it is only when the stalk cracks as a result of the drying process induced by the disease that inversion occurs.

H. G.

**Carboraffin filters in the refinery.** JAR. DEDEK. Z. *Zuckerind. Echozon. Rep.* 46, 251-61 (1922).—The large scale expts. described were to demonstrate the practicability of using vegetable carbons for decolorization. The filtration speed and pressure, temp., refraction, color, alky. and in some cases the invert content of both the filtered and unfiltered clearers were detd. at various intervals. From these data were calcd. the total amt. in hl. of liquor filtered during a given interval, the % decolorization, the amt. of color retained in "gramfuskas" (C. A. 15, 3222), and the loss in alky. in g. of CaO. Graphs are shown in which these variables are plotted against time. The expts. were conducted in 2 refineries, one using the Stanek filtration system and a Janacek press, the other the Schiller-Patzenhofer system and Kroog press. From the results it can be seen that the course of the adsorption on the filters is detd. mainly by the speed of adsorption. The adsorption of Ca is evidently electrolytic. Other N compds. are adsorbed besides those that are colored. The carboraffin adsorbs on the 1st clearer under ideal 40% averaging decolorization 12% Fuskas, on the 2nd clearers 7%, which corresponds to the use of about 0.02% equiv. to 0.1% of carboraffin based on the sugar in the clearer. The comparison and rating of the 2 systems of filtration will be detd. in the next campaign. J. M. K.

**Budan's sulfitation apparatus.** L. RAJMBERT. *J. fabr. sucre* 63, No. 24 (1922).— Cf. Budan (C. A. 15, 3223).

L. E. GILSON

**The Mauss continuous centrifugal separator.** ANON. *Intern. Sugar J.* 24, 308-9 (1922).—In tests conducted at the Sezela factory, Natal, three of these machines filtered 2000 gals. raw juice per hour. The juice was 18.12 Brix, and contained 3.81 parts by wt. of suspended solids per 1000. After passing through the centrifugals the suspended matter was reduced to 0.13 parts per 1000. The purity of the juice was increased from 87.9 to 88.6. The centrifugal consists of a series of double conical drums revolving on a vertical spindle. The juice is fed from the bottom and flows upward, the heavier particles being thrown to the periphery of the drums, and the clear liquid flowing over the top into a circular gutter. The app. is equipped with a special automatic feed, and the drums are held in contact by a toggle gear, which is also used to sep. the drums for discharging the solids from the machine. The machine runs continuously, at a rate of 1000-1200 r. p. m.

W. L. OWEN

**Note on the evaluation of the Clerget divisor in the analysis of sugar mixtures.** R. F. JACKSON and CLARA G. SILSBEE. *Intern. Sugar J.* 24, 313-5 (1922).—A reply to Hinton's criticism of the neutral polarization method (cf. C. A. 16, 1332). In spite of Hinton's objection to the authors' method of evaluating the Clerget divisor when the substance contains invert sugar, they maintain that the change in polarization of a sugar invert sugar mixt. is the same function of the sucrose that it would be in pure aq. soln. of sucrose. This was found to be empirically true, and has since been verified in all analyses.

W. L. OWEN

**Arrangement of the mill control in 1922.** PH. VAN HARREVELD. *Arch. Suikerind.* 30, 325-32(1922).—A blank form of the semimonthly mill report, made by Java sugar factories to the Expt. Sta., is presented with a discussion. No changes were made in the methods of analysis, and only slight ones in the report form. **Arrangement of the fuel control in 1922.** PH. VAN HARREVELD. *Ibid.* 341-6.—A similar report form is presented and discussed, for the fuel, boiler and steam control. F. W. Z

**Regrinding mill rollers.** ANON. *Arch. Suikerind.* 30, 332-6(1922).—Two methods are described and illustrated by which used mill rollers may be reshaped with the appliances found in the machine shop of the sugar factory, and without a special lathe. F. W. ZERBAN

**Composition of the sugar-cane soils of the French Antilles (RIGOTARD) 15.** Philippine gums (WEST, BROWN) 26.

**Treatment of cane juice.** TETSUO IWATA and the TAIWAN SEITO KABUSHIKI KAISHA (the Taiwan Sugar Manufg. Co.). *Japn.* 39,609, Aug. 19, 1921. The juice is mixed with 0.01-0.001% of 30% HCHO soln. and 0.1-0.5% of 96% alc., agitated and boiled for 15 min. After a few hrs., it is sepd. from the ppt., concd. and crystd. as usual. By treatment, the inversion of sugar is prevented and the yield of the crystd. sugar is increased.

**Strainer for sugar juices.** M. E. CARTER. U. S. 1,422,737, July 11.

**Grape sugar from starch.** P. W. ALLEN. U. S. 1,422,328, July 11. A sugar liquor from starch which is free from protein impurities is beaten with air while at a temp. of about 63° and of a d. of about 42° Bé. to give it a frothy porous consistency and it is then allowed to stand until crystn. has taken place.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Review of analytical work applicable to leather and tanning, 1920-21.** F. P. VENTCH AND R. W. FREY. *J. Ind. Eng. Chem.* 14, 825-9(1922).—A bibliography is included. E. J. C.

**The examination of leather [for sulfuric acid].** MARTIN AUERBACH. *Z. Leber-u. Gerberei-Chem.* 1, 227-31(1922).—The effect of H<sub>2</sub>SO<sub>4</sub> on leather depends on the stage of the tanning process at which it is introduced. In drying leather the H<sub>2</sub>SO<sub>4</sub> is concd. and exerts a greater destructive action. Leather treated with various concns. of H<sub>2</sub>SO<sub>4</sub>, air dried, then dried at 50° for 5 hrs. was extremely brittle. The effect of stuffing and of drying (a) 8 days in a desiccator plus 4 hrs. at 50°, (b) 4 hrs. at 50°, (c) 3 and 6 hrs. at 80° was studied on hide swollen with H<sub>2</sub>SO<sub>4</sub> and tanned in H<sub>2</sub>SO<sub>4</sub> and neradol D, quebracho, and sulfited quebracho. With the neradol D leather stuffing increased the tensile strength and extension, while with unstuffed leather these decreased. With quebracho, the stuffed leather had less tensile strength and extension than the unstuffed. With sulfited quebracho, using no H<sub>2</sub>SO<sub>4</sub>, there was little difference between stuffed and unstuffed. With a combined tannage of neradol D and quebracho, after swelling in H<sub>2</sub>SO<sub>4</sub>, both stuffed and unstuffed maintained their tensile strength and showed increased extensibility on drying at high temps. No general conclusions are drawn.

F. L. SEYMOUR-JONES

**Chrome leather analysis. IV. A modified method of determining the amount of alkaline salts in chrome leather.** D. WOODROFFE AND R. E. GREEN. *J. Soc. Leather Trades' Chem.* 6, 222-3(1922); cf. C. A. 16, 1880.—The leather is ashed to render Cr

comps. insol. in acid, a few drops of concd.  $H_2SO_4$  added, excess acid evapd. off and the ash ignited. The residue is extd. with hot water, filtered, and the sulfates are pptd. with  $BaCl_2$  as usual. Ammonium salts are not estd. by this method. Excessive amts. of alk. salts were found in the cracked vamp of a boot which was out of wear. This effect is attributed to perspirations.

F. L. SEYMOUR-JONES

**Leather sampling.** LUDWIG JABLONSKI. *Collegium* 1922, 53-6, 96-7.—The sp. gr., hide substance, and water content of tanned hides were estd. at many different parts of the hide. The figures so obtained vary considerably from place to place, variations being of the order of 30 percent for hide substance and 20 percent for sp. gr. Diagrams of figures on hides and several curves are given. Vertical sections, made lengthwise and transversely across the hide, were made of samples from the butt, neck, tail, and belly. In the butt the fiber bundles are thick and multicellular and generally parallel to the body length. The neck fiber bundles are weaker; the tail bundles are nearly as thick as those from the butt, but are less parallel and more tangled. In the belly the bundles are still thinner and break into single fibers. Some of the fine fibered structure shows gelatinization. Numerous photomicrographs of fiber bundles from different parts of the hide and stereophotographs of the grains of hides are given.

F. L. SEYMOUR-JONES

**Tannin analysis.** JOSEPH SCHNEIDER, JR. *J. Soc. Leather Trades' Chem.* 6, 234-9(1922).—The official shake method is modified in that (a) measurements by wt. are substituted as far as possible for those by vol., (b) a com. dry chromed hide powder is used. Greater accuracy and concordance of results are thereby possible.

F. L. SEYMOUR-JONES

**Committee on limeyard control.** V. The analysis of commercial sodium sulfide. W. R. ATKIN. *J. Soc. Leather Trades' Chem.* 6, 239-43(1922); cf. *C. A.* 15, 959.—An approx.  $M/15$  soln. of  $Na_2S$  (8-10 g. fused sulfide per l.) is titrated to  $p_H$  10 with 0.1  $N$  acid, a comparator and thymolphthalein indicator are used. This gives the alky., leaving in soln. the hydrosulfide ion. An excess of neutral  $HCHO$  is then added, liberating an  $OH$  ion equiv. to the hydrosulfide ion. This is further titrated with acid, giving the sulfide content. The method cannot be applied to used lime liquors, since they contain substances of the amino acid type which react with  $HCHO$  to form free acids.

F. L. SEYMOUR-JONES

**Chrome tanning.** X. Modern problems in chrome tanning. DONALD BURTON. *J. Soc. Leather Trades' Chem.* 6, 226-34(1922); cf. *C. A.* 16, 2618.—B. reviews recent work, particularly his own, on the chemistry of chrome tanning and points out some of its applications in practice.

F. L. SEYMOUR-JONES

**The action of alum on animal glue.** A. GUTBIER, E. SAUER AND F. SCHELLING. *Kolloid-Z.* 30, 376-95(1922).—Alum greatly increases the viscosity of glue, and at higher temp. in weakly acid soln. forms a ppt. which has a clarifying action. Alum lightens the color of both bone and hide glue. At ordinary temp. a higher concn. of alum is required to give a measurable increase in viscosity to bone glue than to hide glue. At higher temp. with prolonged action the viscosity of hide glue falls off markedly, the decrease being proportional to the temp. and the alum concn. Bone glue is more stable. The constituents of the alum soln. responsible for the action on glue are the colloidal  $Al_2O_3$  and the  $H^+$  concn. On dialysis of glue solns. contg. alum, none of the Al passes through the membrane, but the other constituents of the alum pass through. The ppt. formed during clarifying of glue by alum is an adsorption compd. contg. Al and glue. The more rapidly the ppt. settles the better it clarifies. Pptn. results only when a definite amt. of alum is used, and the amt. of ppt. does not increase continuously as more alum is added. The exact conditions for best pptn. must be detd. empirically for each kind of glue and each concn. of glue. After pptn. the glue soln. contains very little Al

and the ash content is less, but it contains all the added acid. In clarifying of glue with alum, after the decrease in viscosity sets in the quality of the glue deteriorates, owing to hydrolysis of the glue. Hide glue is more sensitive than bone glue in this respect. For this reason clarifying with alum is more useful for bone than for hide glues. The foaming of glue is increased by alum clarification, more so in the case of hide than with bone glues.

F. L. BROWNE

•The lyotrope-adsorption theory of gelatin swelling. HUGH G. BENNETT. *J. Soc. Leather Trades' Chem.* 6, 223-5(1922).—Polemical against Atkin (cf. C. A. 16, 24-27).

F. L. SEYMOUR-JONES

Recent chemical and technological advances in our knowledge of gelatin and glue. ROBT. H. BOGUS. *J. Ind. Eng. Chem.* 14, 795-7(1922).

F. J. C.

Determination of bisulfites (KÜHL) 7. Chlorination of cellulose lyes (tanning materials) (Brit. pat. 178,104) 23.

GRÄSSER, GEORG: *Synthetic Tannins: their Synthesis, Industrial Production and Application*. London: Crosby Lockwood & Son. 143 pp. 12s. Reviewed in *Bull. Imp. Inst.* 19, 560(1922).

LAMBERT, T.: *Glue, Gelatin and Their Allied Products*. 2nd Ed. London: Charles Griffin & Co., Ltd. 153 pp.

ROGERS, ALLEN: *Practical Tanning*. London: Crosby, Lockwood & Son. Reviewed in *Chem. Trade J.* 70, 727(1922).

•**Tanning extracts.** W. A. FRAYMOUTH, J. A. REAVELL, AND KESTNER EVAPORATOR & ENGINEERING CO., LTD. Brit. 178,139, Oct. 5, 1920. The usual leach pits are combined with a vat or vats which may be of the kind described in 178,138 comprizing an agitation zone and one or more quiescent zones. The powdered and fine particles of the crushed or milled tanstuffs are introduced into an agitation zone and are wetted by liquor pumped from the leach pits and then agitated by gas uplift tubes. The further introduction of liquor from the leach pits causes the liquor in the agitated zone to pass into a quiescent zone and to flow from the top thereof as a clear strong liquor.

•**Tanning composition.** O. LÖW-BER. U. S. 1,421,701, July 4. A tanning compn. is prepd. by treating about 23 parts of 2,6-naphtholsulfonic acid and about 18 parts of glucose with 10 parts  $\text{CH}_2\text{O}$  at a temp. of about  $90^\circ$ . The product thus obtained is sol. in hot  $\text{H}_2\text{O}$  and does not itself ppt. glue in a neutral state but on acidification with  $\text{H}_2\text{SO}_4$  it ppts. glue with a reddish coloration. The dry substance obtained on evapn. chars without melting. It is readily sol. in  $\text{H}_2\text{O}$  but insol. in ether and  $\text{C}_6\text{H}_6$ . Somewhat similar products are also obtained from: cresolsulfonic acid, glucose and  $\text{CH}_2\text{O}$ ; cresolsulfonic acid, glucose and S chloride; 1,5-naphthylaminesulfonate, glucose and  $\text{CH}_2\text{O}$ ; naphthalenesulfonic acid, glucose and  $\text{CH}_2\text{O}$ ; coal tar phenols b.  $185-200^\circ$ ,  $\text{Na}_2\text{SO}_3$ ,  $\text{CH}_2\text{O}$  with subsequent further addition of  $\text{H}_2\text{SO}_4$ , glucose and additional  $\text{CH}_2\text{O}$ ; *p*-dihydroxydiphenyl, condensed with cresolsulfonic acid and  $\text{CH}_2\text{O}$ , neutralized with  $\text{NaOH}$  and further heated with  $\text{Na}_2\text{SO}_3$ ; *p*-dihydroxydiphenylmethane condensed with 1,5-naphthylaminesulfonic acid in the presence of  $\text{P}_2\text{O}_5$ ; phenolsulfonic acid, glycerol and  $\text{CH}_2\text{O}$ ; tannin, Ba cresolsulfonate and  $\text{CH}_2\text{O}$ ; tannin, naphthalenesulfonic acid, and  $\text{CH}_2\text{O}$ .

•**Tanning with sulfonic derivatives.** A. RÖMER AND L. BLANGRY. U. S. 1,421,722, July 4. Tanning baths are prepd. from aromatic sulfonic derivs. without the use of  $\text{CH}_2\text{O}$ ; e. g., derivs. of 4,4'-dihydroxydiphenylmethane and chlorosulfonic acid, derivs. formed by treating the condensation product of *m*- or *p*-cresol or  $\alpha$ -naphthol and acetone with a sulfonating agent, or 5,5'-dihydroxy-2,2'-dinaphthylamine-7,7'-disulfonic



acid, the sulfonation product of 4,4'-dihydroxybenzophenone or similar compds. Cf. C. A. 16, 2239.

**Tank for heating, mixing and preserving glue.** E. B. APPLIGATE and W. H. YHOMANS. U. S. 1,422,811, July 18.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

**The permanent set of rubber.** F. W. G. KING and A. G. COGSWELL. *India Rubber J.* 63, 30-2(1922); *J. Soc. Chem. Ind.* 41, 110A.—Comparison of the permanent set for different vulcanized rubbers is more conveniently made by using a const. extension rather than a const. load. In order to insure uniformity in results, a reasonably high stress or strain is desirable, 20 min. being sufficient for the application of the stress. Before measuring the permanent set, an interval of 5 hrs. or even less is sufficient. The greater part of the recovery occurs in the first hr.

C. C. DAVIS

**Estimation of rubber as tetrabromide.** F. URZ. *Gummi-Ztg.* 36, 791-2(1921); *J. Soc. Chem. Ind.* 41, 383A.—A weighed amt. of rubber tetrabromide is put in a flask closed with a rubber stopper. This stopper is fitted with a tap funnel, the stem of which reaches nearly to the bottom of the flask, and with a bent glass tube which is connected with a set of absorption bulbs. The flask is immersed in a cold oil bath and a cooled soln. of 1-1.5 g. of  $\text{AgNO}_3$  and 4-8 g. of  $\text{K}_2\text{Cr}_2\text{O}_7$  in 40 cc. of concd.  $\text{H}_2\text{SO}_4$  is cautiously added. After introduction of the whole of this soln. the bath is gradually warmed to 135-40°. After 45 min. the reaction is ended and gentle suction is applied at the outlet of the absorption bulbs (the tap of the funnel now being opened) to carry over all the Br. The liquid in the absorption bulbs consists of 20 cc. of a mixt. of 15% NaOH soln. with a satd. soln. of  $\text{Na}_2\text{SO}_3$  in equal vols. After the reaction this reagent is transferred to a flask, strongly acidified with  $\text{HNO}_3$  and its Br content detd. The rubber stopper outlasts a considerable no. of detns.

C. C. DAVIS

**Estimation of the molecular magnitude of rubber by chemical methods.** C. HARRIES and FRITZ EYERS. *Wiss. Veröffentl. Siemens-Konzern* 1, 87-95(1921).—Reduction of the dihydrochloride of rubber in  $\text{C}_2\text{H}_4\text{Cl}_2$  soln. by means of Zn dust yields a large amt. of  $\alpha$ -hydrocaoutchouc as a light yellow, amorphous, somewhat elastic mass melting between 120° and 130°. From its mol. wt. in  $\text{CHBr}_3$  it appears to be a polymeride of  $\text{C}_{10}\text{H}_{16}$  or  $\text{C}_{10}\text{H}_{18}$ .  $\alpha$ -Hydrocaoutchouc is readily converted into an ozonide and yields a hydrochloride (m. 190-5°) and a bromide. Conclusion: The rubber mol. contains 35 or 40 C atoms, most probably the latter, and the structural formula contains 8  $\text{CH}_2\text{C}(\text{CH}_3) : \text{CH}.\text{CH}_3$  groups joined together in a 32-atom ring.

J. C. S.

**Determination of the acetone-soluble substance in rubber and rubber goods.** J. LAGERQVIST. *Svensk Kem. Tidskr.* 33, 198-205(1921).—Independent estns. of the acetone-sol. material in rubber frequently show considerable discrepancies. Lower results are obtained if the ext. is dried under the ordinary pressure and at 90-105° than under reduced pressure at 50°. In the former case it is almost impossible to obtain concordant figures.

J. S. C. I.

**Treating rubber latex.** E. HOPKINSON. U. S. 1,423,525, July 25. Latex in the form of a spray is treated with air at about 95° to remove moisture and the particles of latex are pptd. and compacted to form crude rubber. ZnO and S may be added. U. S. 1,423,526 relates to crude rubber prepd. in a similar manner.

**Treating latex.** H. A. WICKHAM and ROA, LTD. Brit. 177,262, Dec. 23, 1920.

App. for smoking latex comprizes an endless-band conveyer on to which latex is fed from a reservoir by means of an inclined shoot having raised sides. The conveyer is enclosed in a casing to which smoke is admitted at the end remote from the latex distributor. The smoke escapes from the casing by an exit placed in front of the latex shoot, and is fitted with a scoop terminating near the surface of the band, and with an annular trough which collects condensed moisture. When a sufficiently thick layer of cured latex has collected on the band, it is cut and removed by the stripping rolls.

• **Preserving rubber latex.** F. G. MCGUIRE, A. A. AGAR and H. T. COULTER. Brit. 178,337, April 29, 1921. A preservative for latex consisting of alkalized phenol as described in 11,470 (C. A. 7, 3873) 13,438 (C. A. 8, 3887) and 22,138 (C. A. 10, 1289) is formed into solid blocks to facilitate transport. Two parts of phenol crystals are mixed with about 1 part by wt. of solid NaOH in a warmed receptacle until a white cryst. powder results. This powder is compressed into blocks under pressure (1-2 tons per sq. in.) which only require to be dissolved in H<sub>2</sub>O before being added to the latex.

**Vulcanizing rubber.** S. M. CADWELL. Brit. 177,493, Feb. 15, 1922. The vulcanization of rubber, etc., is accelerated by the addition of a substance of the formula RC(X)SM, in which M represents a salt-forming element or group or H, or a radical SC(X)R or C(X)R. X represents a bivalent element or radical, and R represents any element except N, this exception however being absent when M represents C(X)R. Numerous substances falling within this category are specified. For vulcanizing at ordinary temps. with substances in which M represents a metal, the preferred metals are Zn and Hg; at higher temps., the preferred metals are Zn, Hg, Pb, Cd, Cu, As, Mn. If other metals be employed, one of these metals should be present in the mixing in some form. Bases accelerate the action of these substances. Amines may also be added. With substances in which M represents SC(X)R the time of vulcanization is generally longer, and there is less danger of prevulcanization in the mill. Substances in which M represents C(X)R are especially adapted for hot vulcanization, and there is no tendency to prevulcanization. Cf. C. A. 16, 2793.

**Treating rubber.** E. HUG. Brit. 177,495, Feb. 20, 1922. Rubber articles are treated with a decoction of Roman camomile in rectified castor oil to improve or restore lost elasticity, etc. One g. of camomile is infused in 5 l. of boiling castor oil for 1 hr., and the infusion is poured into 15 l. of untreated oil. For treating a worn inner tube, some of this oil heated to 80° is placed therein, and the surfaces are rubbed together until impregnated. It is then immersed successively in baths of the oil for half an hr. at 50°, a quarter of an hr. at 70°, and 10 min. at 80°, the tire being allowed to stand for 24 hrs. between each operation. Surplus oil is then removed. For treating a new tube, a 10-min. immersion in oil at 80° is usually sufficient.

**Permeable sheet material.** W. A. GIBBONS and H. W. RITTER. Brit. 177,778, March 21, 1922. Artificial leather, etc., is made by mixing a plastic material such as a rubber mixing or nitrocellulose compn. with a filler holding a liquid or gaseous pore-producing agent, and setting the sheet in a pliable, permeable condition. The sheet is preferably made on or applied to a fabric backing. Several examples are given, of which the following is typical, 100 parts of pale crepe, 10 parts of ZnO, 4 parts of *p*-toluidine, 2 parts of S, 4 parts of "dibutylidixanthic-disulfide" are mixed with sufficient solvent naphtha to produce a pasty mass. 100 parts of cotton fiber satd. with H<sub>2</sub>O are mixed with this compn. The mass is sheeted or calendered on to a fabric which has been thinly coated with rubber. The sheet may be embossed, varnished, etc., and is then heated to expel the H<sub>2</sub>O and so form pores, and to vulcanize the compn.; a temp. of 200° F. for 10-30 min. is sufficient. The accelerator may be added more safely at a later stage of the mixing. Other fibers may replace the cotton, and other non-solvent liquids the H<sub>2</sub>O. Dry fibers or substances such as MgCO<sub>3</sub> may be employed in some instances, the

air entrapped in their interstices being sufficient on heating to produce pores. In such cases, the amt. of air may be increased by blowing it into the mixt. A suitable nitro-cellulose compn. consists of pyroxylin 12 g., castor oil 12 g., cotton fibers (wet) 10 g., amyl acetate 200 cc., benzene 125 cc., and C black 1 g. The mixt. is spread on fabric, and dried at about 100° between coats. The invention also includes blended nitro-cellulose and rubber compn. permeable sheets, and sheets of superposed layers of nitro-cellulose and rubber compns.

**Proofing fabrics, wood, etc.** S. J. PEACHEY. Brit. 177,566, Nov. 23, 1920. Addition to 129,826 (C. A. 13, 3040). A gel of vulcanized rubber, prepd. as described in the principal patent, is employed in waterproofing fabrics, paper, leather, rubber, etc. It is also applicable to wood, metal, stone, etc. The gel may be applied directly to the materials to be treated or the mixed solns. from which it is formed may be applied to the materials and the gel formed in position on the evapn. of the solvents.

**Rubberized fabric.** E. HOPKINSON. U. S. 1,424,020, July 25. Unwoven warp-like elements are coated with rubber latex and joined into an unwoven sheet by rubber deposited from the latex.

**Composition for revivifying old rubber.** R. B. MARTIN. U. S. 1,422,115, July 11. A mixt. of cottonseed oil and aniline or other similar amino compd. is used for treating old rubber goods to improve their elasticity. Cf. C. A. 16, 1886.

**Sponge rubber.** A. J. OSTBERG and A. KENNY. U. S. 1,422,884, July 18. Sponge rubber is prepd. by vulcanizing a mixt. formed of Para rubber 15 lbs., reclaimed rubber 15 lbs., S 13 lbs., zinc white 9 lbs.,  $MgCO_3$  1.5 lbs. and sufficient volatile mineral oil to soften the rubber. Cf. C. A. 16, 1164.

**Repairing rubber articles.** W. FROST and H. FROST & Co., LTD. (Brit. 178,205, Jan. 13, 1921. Rubber articles, such as tires, are repaired by the use of a mold made from an undamaged portion of the article. The mold is made of a metal which is fusible at a temp. higher than that necessary for vulcanizing, e. g., 280° F., but lower than that which will damage the rubber, e. g., 320° F. A suitable alloy comprises 1 part of Sn and 1 part of Bi, m. at 286° F.; or 3 parts of Pb, 3 parts of Sn and 1 part of Bi, melting at 310° F.









